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Western Progress Number

Journal of Electricity and Western Industry

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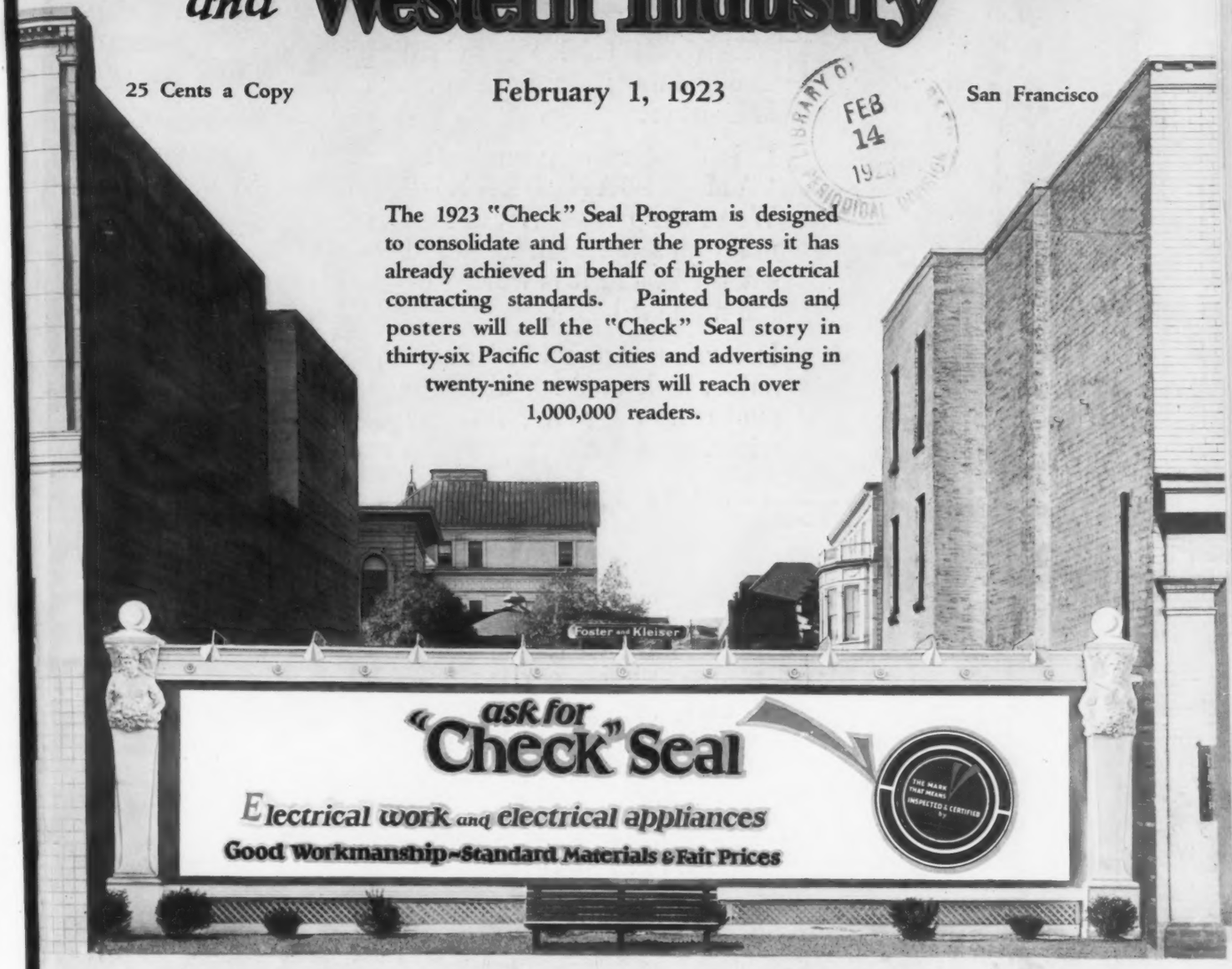
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Journal of Electricity and Western Industry entered as second class matter February 17, 1921, at the post office at San Francisco, under the Act of Congress, March 3, 1879.
Published the 1st and 15th of each month, at Rialto Building, San Francisco, California.

FEB 2 1923
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Journal of Electricity and Western Industry

A McGraw-Hill Publication

Established 1887

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VOLUME 50 | SAN FRANCISCO, FEBRUARY 1, 1923 | NUMBER 3

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PUBLISHED SEMI-MONTHLY BY

McGRAW-HILL COMPANY OF CALIFORNIA — Rialto Building — SAN FRANCISCO

James H. McGraw, *President* — C. T. Hutchinson, *Vice-pres. & Gen. Mgr.* — C. M. Lindsay, *Vice-pres. & Treas.*

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Publishers of

American Machinist—European Edition
(*Published in London*)]

Industrial Engineer
(*Published in Chicago*)

Chemical and Metallurgical Engineering
American Machinist — Ingenieria Internacional
Electrical World — Electric Railway Journal
Engineering and Mining Journal-Press
Bus Transportation — Engineering News Record
Coal Age — Electrical Merchandising — Power

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Member Audit Bureau of Circulation
Printed in U. S. A.

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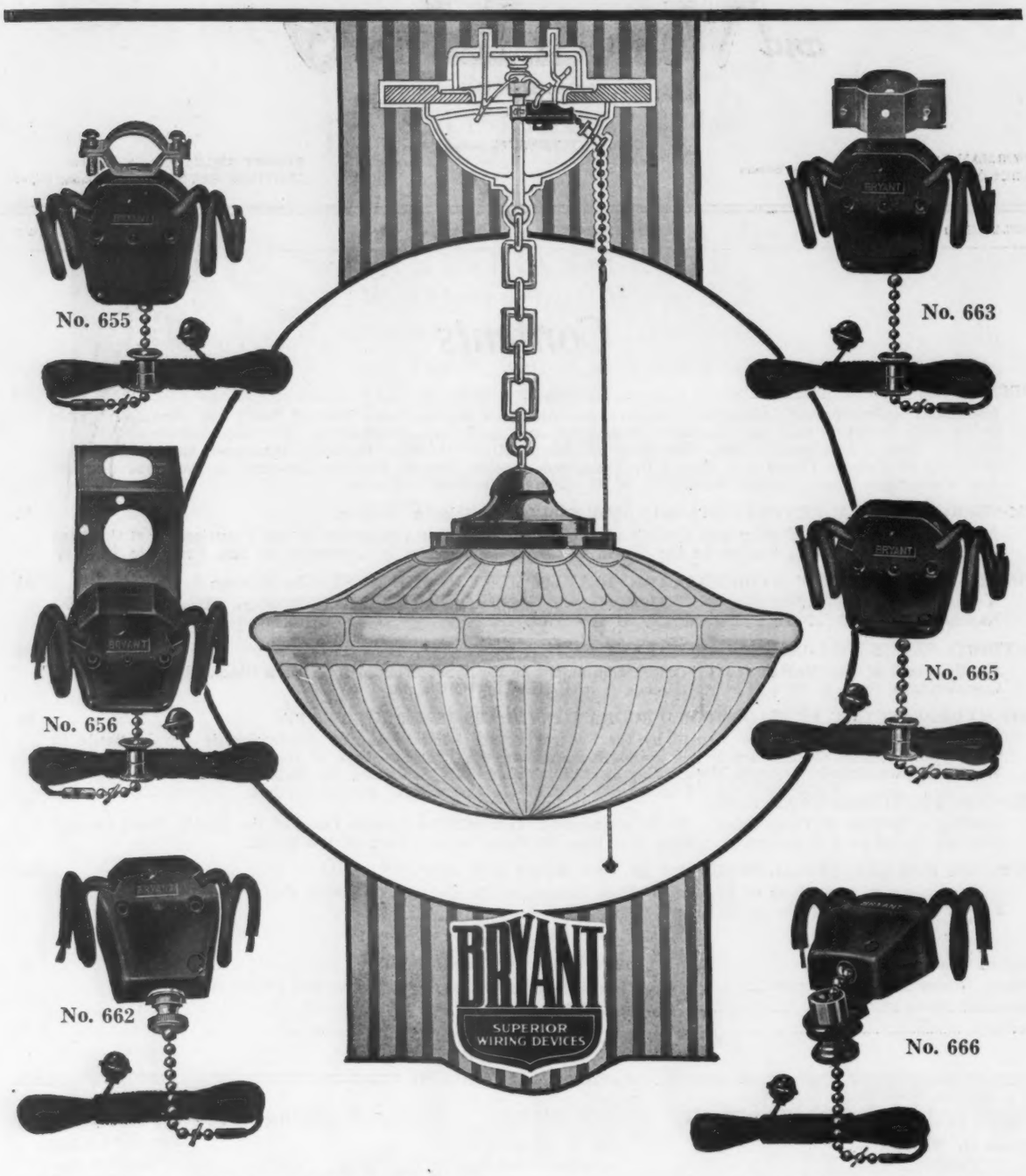

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Electricity and Progress

IN ITSELF, the word "progress" connotes a forward movement. Progress, however, means more than that. The movement must be not merely forward; it must be toward better things. In this sense electricity is synonymous with progress. The history of electrical development is a record of constant betterment of the condition of mankind. Progress and moral advancement have been and always will be a problem of the ages, as slow to come as the reactions of human nature. But the past fifty years have borne witness that a single generation can forever leave its impression upon the world's economic condition, vitally affecting the welfare of mankind. There never was a time in human history where there was so much to be done and when we knew so well how to do it. Electricity will provide the means. Electricity has become one of the most important elements in our daily lives. Progress in almost every line of industry is predicated upon it.

TODAY, the chief factors governing electrical progress are known within a reasonable degree of accuracy. One of the established facts is that the United States can use to advantage all of the electrical energy that can be generated within its borders. Everyone concedes the superiority of electricity for lighting, for driving industrial and mining machinery, for producing heat for industrial processes, for the manufacture of many chemical compounds, for supplying power on the farm, for cooking, heating and operating a variety of labor saving devices in the home, and for every form of transportation. The potential demand will beyond doubt always exceed the supply.

WHILE the United States is the most highly developed country electrically in the world, only 35 per cent of the population is enjoying electric service. In the West 73 per cent of the population is served by electricity. Interconnected power lines, discussed in other sections of the country, are an accomplished fact in the West and a full use is made of the greatest, cheapest and most obliging servant in the world. Nature, in what might be regarded as an effort to compensate the West for the oversight in failing to provide local deposits of steam and coking coal, blessed us with an abundance of potential water power. Thanks to the initiative, indomitable will and faith of the western people, leadership in the development of hydroelectric power is overwhelmingly in the territory contiguous to the Pacific Ocean. This leadership is not confined merely to the development of the power, but also to its application to industry and especially to the home.

EACH year unfolds its story of accomplishment. As mechanical energy supplants the work of many hands, production is increased and the wastes of war and social disorder are neutralized. The West can well be proud of its part in creating new national wealth; in showing the way to better the condition of mankind.

Manufacturers Are Accorded New Rights Under Current Tariff Act

NEW and highly important rights have been accorded the American manufacturer under the Fordney-McCumber tariff act, and electrical manufacturers and producers should be prompt to avail themselves of these privileges.

For the first time in history American manufacturers and producers are put on the same legal footing with importers and can intervene in upholding the integrity of the law. Heretofore manufacturers have been denied effectual participation in the construction of tariff acts. Also, despite the fact that a protective tariff vitally affects the immediate interest of three parties, the Government, the manufacturer and the importer, the manufacturer has never been accorded the right of contesting rates of duty and constructions of the tariff law. The importer has, on the other hand, been empowered to protest against any appraised value, or any rate of duty, or any construction of that law, as applied to any imported merchandise.

These rights are granted by the current act, as well as the right to oppose importers' claims. It therefore behooves every manufacturer to be vigilant and assert and defend before the customs officials and courts the protection accorded him by the existing law.

Regulation Held to Be Only Bulwark Between Individual Enterprise and Socialism

A FAMOUS novelist, writing in a current magazine, advises a philosophy of life founded somewhat on pessimism. He says in effect that that one should anticipate the worst; if one loses, as much was expected; if one wins, one knows the intense joy of surprise. The content of the average daily newspaper, filled as it is with hypocritical pap calculated to appeal to the emotional reader, is enough to insure pessimism in anyone. One grows to expect the worst. "The intense joy of surprise" fittingly describes the immediate reaction to an editorial differing from the unusual run.

An example in point is an editorial appearing in the Denver Times, of recent date. "Efficient, equitable public regulation of utilities is the only bulwark now remaining between individual enterprise in transportation, power, light and heat, and government or public ownership," says this paper in commenting upon an address by Carl D. Jackson, former president of the American Association of Public Utility Commissioners and for many years a member of the public utilities commission of Wyoming. Mr. Jackson, who has been speaking before Colorado state educational institutions and groups of Denver business men, has drawn forth considerable comment in the press.

The Times goes on to state that "Public ownership is looked upon by many as the universal panacea for many economic ills. It destroys personal and private initiative, creates a bureaucratic form of administration and tends toward inefficient management because the public is obligated to make up any deficit which may occur, due to poor executive leadership and lack of business ability. Private enterprise must be successfully carried out in order to survive; public business is, on the other hand, notoriously lax, extravagant and wasteful. Conditions in any city hall in the United States of America confirm this statement. And, of course, public ownership throws public utilities into politics.

"Granted the right kind of commissioners, regulation offers the public the best guarantee of adequate service by utilities. Such men, however, should be experts and not politicians, endowed with independence and courage and concerned in making just, rather than popular decisions, for upon their judgment and integrity depend not only the interests of the consumer, but the legitimate success of the producer. Their failure means another step in the consummation of the dreams of the Communist."

The Journal of Electricity and Western Industry has consistently held that industrial, financial and economic stability are predicated upon sane utility regulation. The Denver Times is to be complimented on its constructive stand.

Washington Bill Would Permit Cities to Operate Beyond Municipal Limits

UNDER the terms of a bill introduced in the Washington State Legislature, Seattle and other cities owning electric plants may be authorized to sell electric energy outside their corporate limits provided 5 per cent of the gross receipts of such sales are credited to the county current expense fund in the county where the sale is made. The bill is designed to permit Seattle, Tacoma and other municipalities to market their surplus power and at the same time to make such sales a source of revenue to the counties where the power is consumed.

The bill further provides that the auditor in the county where the power is sold shall have access to the books and records of the city or town furnishing the current for the purpose of determining the amount of revenue to be paid into the county treasury. Immediately after presentation of the measure in the legislature, a fight, sponsored by the municipalities interested, developed over the 5 per cent tax clause and a second bill has been presented with this item removed.

To permit municipalities to sell power outside their corporate limits is manifestly discriminatory, but should this step be taken it is only just and right that some form of tax be levied upon them.

Diagnosis of Our Political Troubles Discloses Ignorance and Selfishness

IT IS becoming evident every day that the body politic is subject to more ills than the flesh. There is also the increasing difficulty of properly diagnosing and prescribing for our political troubles. Too many cooks spoil the broth, and too many doctors in the political world make the condition of the patient more dangerous.

We all have a fairly good idea of what the disease is but our diagnoses differ and we cannot agree on a cure. However, the situation owes, if not its origin, at least its growth to the ignorance of the people in matters political, economic, financial and industrial. Ignorance in itself is not a serious disease, but it is dangerous.

Government is today not merely the enforcement of laws for the safety of the citizen. It is a complicated mechanism upon which man relies for his prosperity as well as his protection, and, in fact, it is a supreme although indefinite paternal being to whom he turns with his troubles and his problems. Consequently, the problems of government are enormous. The possibilities of error are multiplied. The certainties of criticism and irritation have become innumerable and the ignorance of the people as to the limitations of their government and its power make for chronic trouble. This also makes it easy for the unscrupulous propagandist to paint pictures of a future in which the present form of government is destroyed and his vaporous theory of a millennial government has become an actuality.

We have men entrusted with power who are not fit either by training, conscience or patriotism to have even a voice in the affairs of the government. It is only because of lack of understanding that radicalism grows—for radicalism is composed of two powers: one is the shrewd maneuvering of selfish intelligent men, with the power of eloquence to sway unreasoning followers; the other is the man who, being irritated and resentful, is willing to accept any promise which conveys to him the possibility of a return to easier conditions. If he had knowledge of simple economics he would never be a party to the apparent growth of radicalism. It is obvious that to prevent the spread of radicalism the causes for that resentment must be eliminated. The causes, as already pointed out, are ignorance of simple economic truths, and with education and knowledge of facts there would be no resentment. Education is therefore more necessary than ever before, education which will teach men and women the simple truths of economic laws. If our political national control passes into the radical group during the next two years, we and we only are to blame.

Chronological Tabulation of Western Hydroelectric Plants

ON ANOTHER page in this issue appears a tabulation listing the important hydroelectric plants installed in the seven western states since the inception of the industry. The data contained therein have been compiled from reliable sources and are believed to be correct. Many isolated plants of small capacity, concerning which complete information could not be obtained, have been omitted. A complete tabulation listing every plant, and containing additional information, is planned for a subsequent issue. This work will be facilitated if readers will advise us of any corrections or omissions noted in the present table.

Integrity of Federal Power Act Should Be Preserved

A WARNING is sounded in the second annual report recently issued by the Federal Power Commission which should not be disregarded by those interested in the development of our water powers. The report refers to movements on foot in several quarters to secure for certain sites or streams special legislation. These, if approved, would constitute a partial repeal of the Federal Water Power Act, and would eventually result in the progressive disintegration of our present national water-power policy. Requests that rights or authorities be granted independently of the present law are obviously made to avoid complying with essential features of the act, particularly those designed to protect the public interest.

Furthermore, to quote the report, "the granting of special privileges to favored interests would clearly discriminate against those who, in the faith that Congress had at last fixed its policy, are investing hundreds of millions of dollars under the obligations of the Act." It would be a serious mistake to permit the policy of the Act to be essentially modified except after fair trial and convincing evidence of the desirability of change. The Act has proved successful; there is no need for modification. Essential justice demands, however, that any modification made should be a change in the general law and not special legislation applicable to a particular site.

Pacific States Electric Company to Continue "Check" Seal Campaign

THE first year of the "Check" Seal program, inaugurated by the Pacific States Electric Company, has, in the opinion of company officials and others, proved the soundness of the principles upon which it is based. In fact, its measure of success is such that not only has the company decided to continue the program, but to expend greater efforts in bringing the principles it represents to the attention of the public.

Electric household appliances are still regarded with a certain amount of distrust and apprehension by many consumers. For the most part, electricity is a mystery to the layman. Lacking in knowledge of electricity, its technology and terminology, the average buyer has had little or no personal method of discriminating between the relative merits of electrical appliances and electrical installations. The program to establish a trade mark as a means by which the public can determine quality is an interesting step in overcoming the sales resistance due to a lack of knowledge of the finer points of electrical appliances and electrical construction.

The success of the program is not only of direct interest to such contractor-dealers and companies as are personally concerned, but the subsidiary effect in producing a more receptive attitude on the part of the public,—and, it may be added, a wider understanding on the part of the electrical fraternity itself, is a distinct contribution to the general progress of the industry.

CURRENT COMMENT

California Mines Show Record Output for 1922

The total value of the mineral production of California for 1922 is conservatively estimated by the statistical division of the State Bureau of Mines to have been $257,351,690, a decrease of approximately $10,805,000 over 1921, due largely to the lower prices prevailing for crude petroleum and an apparent decrease of almost a million dollars in the gold yield. Petroleum with a record yield of 139,000,000 barrels, represents $191,000,000 of the total of the state's mineral output.

Copper furnishes cause for optimism with a yield almost double that of 1921, owing to resumption of activity in the mines after almost a year of idleness. Silver production will approximate that of 1921 while lead, zinc and quicksilver will show slight increases. The estimated quantities and values for 1922 follow:

$14,900,000	gold.
3,200,000	(3,200,000 fine oz.) silver.
3,035,100	(22,650,000 lb.) copper.
356,250	(6,250,000 lb.) lead.
206,340	(3,620,000 lb.) zinc.
217,000	(3,500 flasks) quicksilver.
58,500	(650 fine oz.) platinum.
191,000,000	(139,000,000 bbl.) petroleum.
5,250,000	(75,000,000 M. cu. ft.) natural gas.
33,000,000	brick, cement, building stone, crushed rock, etc.
2,750,000	miscellaneous "industrial" minerals.
2,750,000	salines (including borax, potash, salt, soda, etc.).

Celebrate 30 Years of Hydro Progress

The thirtieth anniversary of the opening of the first polyphase hydroelectric plant equipped for long distance transmission, Mill Creek No. 1, operated by the Redlands Electric Light and Power Company, was recently celebrated by the Los Angeles Electric Club. At present a unit in the system of the Southern California Edison Company, the plant is functioning today just as it did thirty years ago. No better idea of the progress which has been made in hydroelectric development during the past three decades can be gained through a brief resume of the history of this first plant.

The Redlands Electric Light and Power Company was incorporated Oct. 6, 1892 by Messrs. H. H. Sinclair, George B. Ellis, George H. Crafts and Fulton C. Feraud. The site chosen for the plant was on Mill Creek, about eight miles east of Redlands. Their consulting engineer was A. W. Decker, an electrical engineer whose vision led him to adopt methods far in advance of those which obtained at that time. Owing to the distances over which it would be necessary to transmit the power, Mr. Decker insisted upon installing a three-phase system similar to the one being operated for experimental purposes in Tivoli near Rome. Plans and specifications were prepared and submitted to electrical manufacturers, but it was only after some months and considerable effort that they could be induced to bid on the installation, the manufacturers recommending the use of such apparatus as was standard at that time.

The General Electric Company finally agreed to build two 250-kw. three-phase generators which were installed in the plant at Mill Creek. These generators and some of the original motors connected to the lines, the first of the kind ever turned out by the General Electric Company, are still in daily service and operating in parallel in perfect accord with the latest creations.

The waters of Mill Creek used for turning the Pelton water wheels which were connected to the generators were diverted at a point approximately two miles above the plant, and conducted through a thirty-inch steel pipe line, a distance of 10,250 ft., where they were dropped into the power house under a head of 530 ft. Energy was carried over a high voltage transmission line four and a half miles to the plant of the Union Ice Company at Crafton and thence three and a half miles further to the city of Redlands.

Later water was diverted at two other points along the canyon and plants No. 2 and No. 3 constructed.

On April 19, 1897, the Southern California Power Company was organized for the purpose of utilizing the waters of the Santa Ana River for the generation of power. Shortly after this the Redlands Electric Light and Power Company was merged with the new concern and ultimately both became part of the system of the Southern California Edison Company.

The ambition of the Redlands Electric Light & Power Company was to furnish electricity to the city of Redlands for domestic and commercial purposes. The first installation was for the generation of energy at 2,500 volts, carried at a like voltage on the transmission line to the city and stepped down to 110 volts wherever the occasion demanded. Shortly

after this the voltage was raised to 10,000 volts and power transmitted to the State Hospital at Patton.

The current was turned on the arc light system in Redlands for the first time on Aug. 5, 1893. The occasion is best described in the following quotation from the local paper:

"At 7:30 the carbons began to glow and in a moment the long looked for, eagerly anticipated lights were illuminating the business part of the town with a brightness hitherto unknown after the sun had set. Three lights were in operation, one each at the intersection of Water and Orange, State and Orange streets and Citrus avenue and Orange street. The first two are suspended over the middle of the street, while the latter is on a shaft about fifteen feet in height. The lights are very brilliant and steady and the effect perfectly satisfactory to all. Chairs were brought from the Y.M.C.A. and planted under the light at State and Orange and the band celebrated the event of the evening by a concert in its best style."

The passing of thirty years has witnessed stupendous development in hydroelectric generation, not only in California, where this pioneer plant was located, but throughout the entire West. Mill Creek No. 1 with its 250-kw. units and its 10,000-volt transmission line, has given away to plants with 35,000 kw. and transmission lines with voltages ranging up to 220,000.

Utilities in California Are Expanding

California utilities are keeping abreast of the needs of a rapidly expanding state, according to development statistics contained in the annual report of the State Railroad Commission. This is indicated by the large increase during 1922 in securities authorized for additions and betterments, according to the commission, which says:

"This year's authorizations for additions and betterments amounted to $148,925,206.53, compared with $94,124,945.91 for the preceding period, or an excess of $54,800,260.62. That development is not only continuous but at an accelerated pace is shown by the fact that 1921's gain over 1920 in securities for development purposes amounted to $34,711,-173.35.

"For all purposes securities authorized this year aggregated $188,401,250.99 as against $168,497,-596.91 for the preceding year. Next to that for additions and betterments the largest item was $19,075,793.06 for refunding purposes. This was due to declining interest rates, the reverse of the case in the past several years when interest rates were high. Accordingly a number of the utilities took advantage of the situation to refund high interest bond issues.

"With the marked decline in interest rates there occurred a corresponding increase in the prices of public utility stock and bonds. This condition was not peculiar to California, but marked a national and even world-wide readjustment. The lowering of interest rates has been of material benefit to California utilities and to rate-payers. As the rates must necessarily be based on future conditions, this tendency was reflected in rate computations.

"The commission kept in close touch with the fall in interest rates and the advance in the price of securities, and in accordance with this movement governed its action on passing on new securities. Proposed interest rates were cut and the minimum selling price of stock and bonds advanced in a number of cases to bring them in line with conditions as reflected in the market quotations."

Wired Wireless Is Successfully Demonstrated

The demonstration of a new and unique method of communicating and broadcasting over electric light and power lines, by means of General Squier's system of "wired wireless," at the Bureau of Standards in Washington recently, indicates that within a short time all consumers of electric current may be able to plug in their radio sets to their lamp sockets and receive information and entertainment broadcasted by the large light and power companies. The system is controlled by the North American Company of New York, which owns and operates the lighting utilities of Cleveland, Milwaukee, St. Louis and a number of other cities and which has secured an exclusive license number under General Squier's patent rights for this purpose and is now developing the plan.

With the aid of a small condenser in series with vacuum tube receiving sets, or a special plug, consumers of electricity will be able to receive broadcasts from their electric wires just as they get energy to operate the flat iron, electric toaster or hair curler today. One button will produce "jazz," another news and a third grand opera, as soon as the power companies start broadcasting over their wire systems. The ether will in no way be disturbed by this sort of direct radio broadcasting, and Secretary Hoover will not have to assign wave lengths or worry about interference with other stations using the ether—there will be no interference as the air is not used.

With the aid of a regulation broadcasting set at a substation of the Potomac Electric Power Company, messages were transmitted, recently, over this company's lines, carrying 2,400 volts of alternating current, to the signal corps laboratory, Bureau of Standards in Washington, where they were received by means of a tube set coupled with condensers. The sending station was located at Georgetown. The wave which followed the wires was of 5,000 meters or 30,000 cycles and a transmitting current of 0.050 amperes was employed.

Following tests of General Squier's invention in Cleveland last May and further trials in New York in August, the North American Company concluded that a practical application of the system was of value and would permit the furnishing of an additional important service to lighting and power customers.

OUT of castles in the air which found their first materialization in such as the Rome Plant of the Nevada Power Company in 1896, have grown the huge generating stations of today, of which this Big Creek No. One of the Southern California Edison Company is typical. Throughout the years the West has consistently led in hydroelectric development.

JOHN A. BRITTON

Pioneering In the Central Station Industry

San Francisco Had the First Central Station in the World

By JOHN A. BRITTON

Vice-President and General Manager, Pacific Gas and Electric Co.

WIDESPREAD publicity, through the daily as well as the technical press, has been given during recent years to three important points in connection with the leading part California has played, and continues to play, in the development of the electrical industry not only in the West but the entire country:

(1) California leads the country in hydroelectric development as measured in kilowatt hours output; (2) California leads the country in the per capita consumption of electric energy; (3) California was the pioneer of the entire world in hydroelectric development of electricity for commencial purposes. A fourth point, however, appears to have escaped general observation. That is, California established and operated the first electric central station in the world. This was in San Francisco in the year 1879.

It is of great importance, it seems to me, that in view of recently published statements elsewhere, this point should be clearly established to the satisfaction of all those who, directly or indirectly interested in the electric industry in our country, wish to see the details of its progress and development historically accurate.

There can be no question of the justice of San Francisco's claim to the first central station. For the benefit of all interested I present the facts as they stand. They appear in a brief history of the rise and development of the electric light industry in San Francisco compiled under my direction by Mr. Charles L. Barrett, who has been a prominent figure in the public service in San Francisco all his life. No more painstaking investigator ever collected facts to lay before the public.

THE first public street exhibition of electric lights and lighting in San Francisco took place upon the evening of July 4, 1876, the opening day of the Centennial Exposition at Philadelphia. On that evening three large French arc searchlights, operated and erected by the Reverend Joseph M. Neri, and located upon the north end of the roof of St. Ignatius College, which stood upon the south side of Market Street, between Fourth and Fifth Streets, were exhibited to the public. The machines used to generate the current were an old French machine used at the siege of Paris, 1871, a more modern Brush machine, and one of Father Neri's own make. The town turned out en masse to see the light effect, which at the time seemed wonderful. Father Neri, a renowned investigator of physical subjects, also lectured upon and conducted exhibitions in the public hall of St. Ignatius College with the Jablackoff candle, an electric light which promised "to revolutionize" the lighting of the world.

At the annual fair of the Mechanic's Institute at the Mechanic's Pavilion in the fall of the year 1879, there was exhibited the first commercial arc lighting in San Francisco. This was done in two separate exhibits, the exhibitors being the Brush Electric Company, whose machines were used to operate the lights, and the California Electric Light Company, which exhibited lights and other apparatus.

On June 30, 1879, the California Electric Light Company was incorporated with a capital of $5,000,000. This incorporation grew out of a transaction by which the firm of Roe & Plummer, took as security for a debt, some electric machinery shipped by the Telegraph Supply Company, of Cleveland, Ohio, the predecessor of the Brush Electric Company. This machinery, at the dissolution of the firm of Roe and Plummer, came into the possession of George H. Roe.

The first plant was started in the rear of what is now the Pacific Building, on the corner of Fourth and Market Streets, and it had the distinction of

being the first electric lighting central station established in the world. Electric lights had been used before this time in factories, mills and other places where power was available, but this was the first building erected for the purpose of distributing electric light and this was the first time electric light had been distributed throughout a city. This plant lasted but a short time, as it was destroyed by fire. The company's generating station was then moved to 119 O'Farrell Street, between Powell and Stockton Streets.

The company then acquired a piece of land on Jessie Street between Third and Fourth Streets, adjoining the Grand Opera House. In 1886 the location was added to, and became known as Station "A." The equipment at that time consisted entirely of what was known as the No. 8 Brush arc machine, having a rated capacity of sixty 2,000-cp. lamps. Incandescent lighting was comparatively unknown. A few groups of eight 16-cp. lamps, known as the "Multiple Series System," were installed, and connected directly in the arc circuit and equipped with the Brush-Swan electric carbon lamp, which, at that time, cost $1 each. The purpose of this system was to enable the consumer to use incandescent lamps on a series arc light, which, in the early days of arc lighting in San Francisco, were run at 9 6/10 amp.

The original price charged for 12 o'clock arc light service, the plant then being shut down at midnight, was $10 per week per lamp. This, however, was gradually reduced, and in the early part of 1887 the standard schedule was $3 per week for 9:30-11 o'clock on Saturdays, and no lights Sundays or holidays—$4 per week for 12 o'clock lights, $6 per week for all night lights.

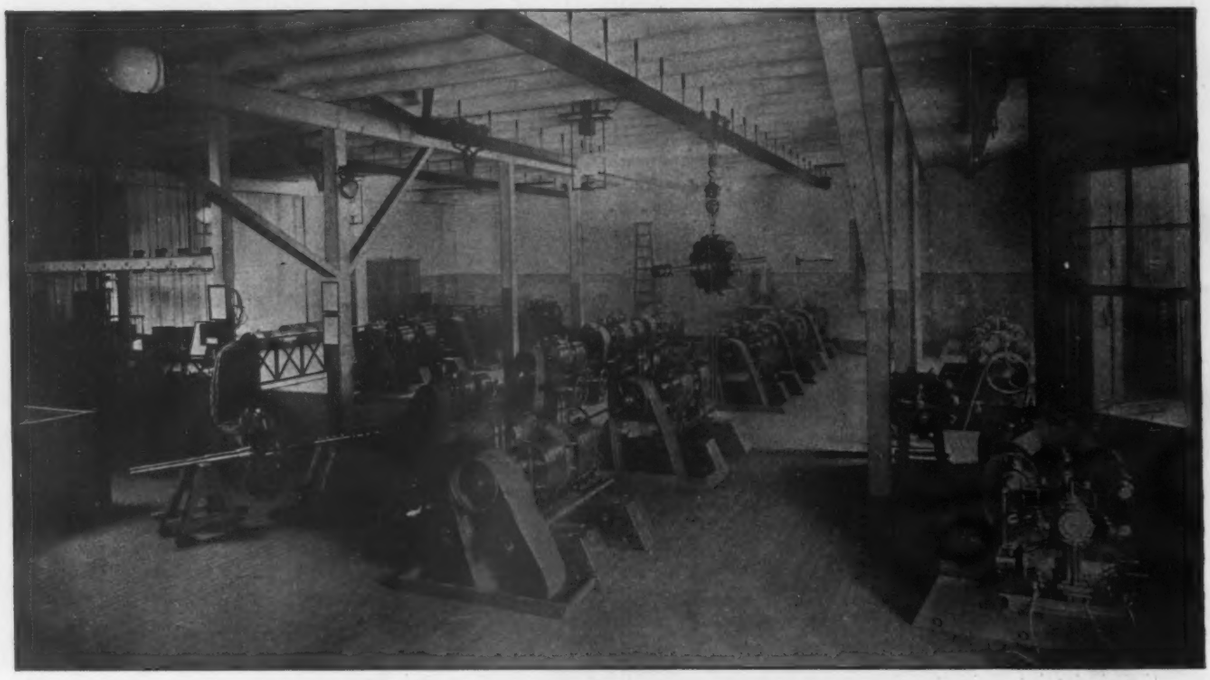
At this time the company was furnishing about 1,500 arc lights, including its private consumers and the city and county of San Francisco, the latter being supplied largely by what was known as the "Mast System." Under this system there were twenty-one masts, 150 ft. high, carrying four 4,000 cp. lamps each, situated, largely, in the outskirts of the city.

Early Commercial Lighting

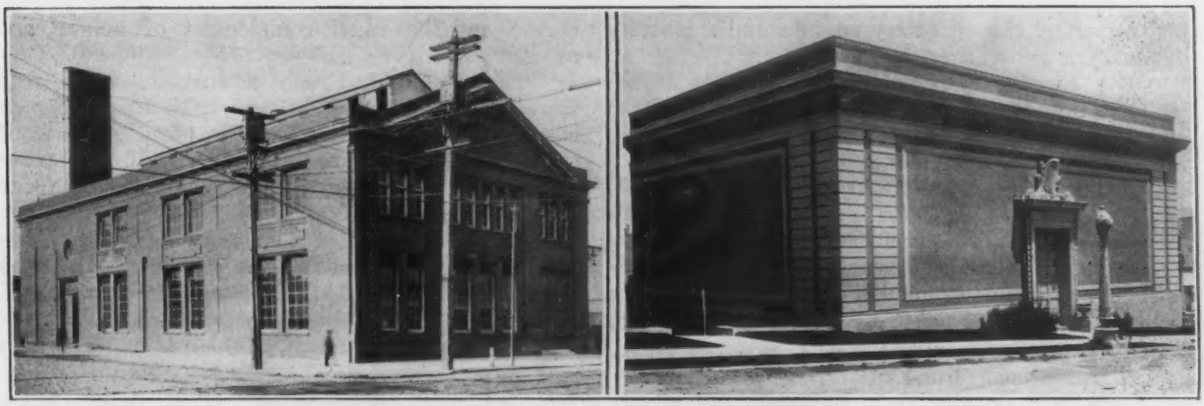
During 1887 two series of the Brush multiple lamps, aggregating sixteen lamps, were installed in Rosenthal's shoe store on Kearny Street, eight in each window. In the spring of 1888, five series, aggregating forty lamps, of this same type were installed in the Bush Street Theater. This was the first theater in San Francisco to use incandescent lamps, and their novelty was a great drawing card for patrons and curious people interested in the development of the electric light.

In January 1888, owing to the increase in business, the company authorized a bond issue of $300,000, and with the money built station "B" on Townsend Street and Clarence Place. The original equipment for this station consisted of a 700-hp. tandem compound engine, followed later by a 1000-hp. cross compound engine, and later by another engine of the same type, and a remodelled engine of 600 hp. The electrical equipment consisted approximately of thirty-two No. 8 Brush machines.

Early in 1888, a 300-light Brush 110-volt d. c. machine was purchased, and furnished incandescent lighting for the new office building to the California Electric Light Company and also for three consumers, the Bijou Theater, the Cafe Royal and the People's Bank, all on the south side of Market Street between Third and Fourth Streets.



This plant, dating from 1880, was built in San Francisco by the California Electric Light Company. The picture shows the old type Brush generators, and at the extreme left the early form of switchboard.



The old plant of the Mutual Electric Light Company at Steuart and Folsom Streets (left) and one of the modern substations, Station "K," a part of the San Francisco system of the Pacific Gas & Electric Company (right).

In July, 1888, E. J. Baldwin started an electric plant on Stevenson Street between Fifth and Sixth Streets, and commenced to light the Baldwin Hotel therefrom. This plant consisted of a Westinghouse vertical engine, attached by belt to a Westinghouse a. c. generator.

Introduction of Incandescent Lighting

Owing to the rapid introduction of the incandescent lighting system in other cities, it became necessary to take up this matter seriously, and a 1,000-light Brush alternating machine, 2,000-volt primary, was purchased. This was installed in station "B" and connected to a 100-hp. "Ball" compound engine. In the meanwhile, lines were run, and on a Saturday morning in September, 1890, the machine was started. At this time this machine supplied seven consumers, consisting of a restaurant at 1366 Market Street; Yosemite billiard parlors, St. Ann's Building, the Bank of California; Balfour, Guthrie & Company; the London & Liverpool & Globe Insurance Company, and F. A. Hyde. Light was furnished that night and the machine shut down about noon. The next day, being Sunday, the machine was looked over, and started up again at 3 o'clock. It seems, however, that the governor of the engine was out of order, and as a consequence, about 10 minutes after 3 o'clock the machine blew up, owing to the excessive speed, and was scattered all over the station, one field coil being thrown through the front window and falling within 5 ft. of the gas tank of the Pacific Gas Improvement Company, just across the street. That night, upon the return of Mr. Roe, the manager, from San Jose, a machine to replace it was ordered by telegraph, and Professor Hesse, of the University of California, was taken into council on Monday morning to figure a set of disks to which the field magnets could be attached in order to obviate the possibility of a similar accident. This machine arrived about 60 days later by express and was immediately put into service. Three other machines of similar type were purchased as the business increased.

The California Electric Light Company also held the patent rights of the Brush Electric Company for the states of California, Oregon, Washington and Nevada. Many plants which are now part of the Pacific Gas & Electric system were originally equipped by this company with the old Brush arc machine. These patent rights became extremely valuable on account of the double carbon arc lamp patent, which was sustained in a number of suits, practically keeping every other arc lamp out of the field. Upon the incorporation of the Edison Light & Power Company, the supply business, in so far as machinery jobbing was concerned, was discontinued.

The first electric public street lighting was done by the California Electric Light Company, commencing July 2, 1883, the first lamp used being a 2,000-cp. arc lamp upon a pole located opposite the New City Hall in Park Avenue. Between this date and March, 1884, thirty-five blocks bounded by Ellis, Pine, Powell and Leavenworth Streets, were lighted, and on March 10, 1884, the company offered to light the whole city with Brush arc lights under the following proposal:

672—2,000-cp. lamps @ $0.66 each per night.
132—4,000-cp. lamps @ $1.32 each per night.

The 2,000-cp. lamps were to be placed singly upon 35-ft. poles and the 4,000-cp. lamps to be placed upon thirty-four masts, 150 ft. high, each mast carrying four 4,000-cp. lamps. A contract was finally let to the California Electric Light Company for a term dating from Sept. 1, 1884, to July 31, 1886, for four 150-ft. masts and one 100-ft. mast each equipped with four lamps of 4,000-cp. each at $5.28 per mast per light night, provided the installation was successful for thirty days. No extension of the district lighted by single arcs was made.

In August, 1886, the plant of the California Electric Light Company generated all current by steam. The company was supplying to private consumers at this time current for 500 lamps of 2,000 nominal candle power at the following prices: all night, $6 per lamp, per week, 12 o'clock $4 per lamp, per week. Early in 1889 the Electric Improvement Company started by I. Gutte, A. St. J. Bowie, the Howard Estate, Louis F. Haggin and others, commenced to operate a small plant at the junction of Vallejo, East and Davis Streets. In 1890 this company wired the Palace Hotel for incandescent light-

ing, installing the necessary engines and a Slattery dynamo for generating the current.

The Electric Improvement Company's Palace Hotel station at the corner of New Montgomery and Mission Streets, supplied arc lights only, for a long while, having as many as 800 in use. The prices charged per week were $4.50 for all night lamps, $3.50 for 12 o'clock, and $2.25 for 9:30 o'clock lamps. Not being able to get permission to place poles, except upon Mission Street and the city front, this company strung its wires on house tops on the other streets traversed, notably, Kearny, Market, Pacific and Montgomery Streets, and in consequence was always in trouble concerning them.

In December, 1892, or January, 1893, the Electric Improvement Company sold its San Francisco property to the Edison Light & Power Company for 1,330 shares of the stock of that corporation. During the competition with the Electric Improvement Company incandescent rates were practically cut in half, reaching as low as 10 cents per kw-hr.

The Electrical Equipment in 1890

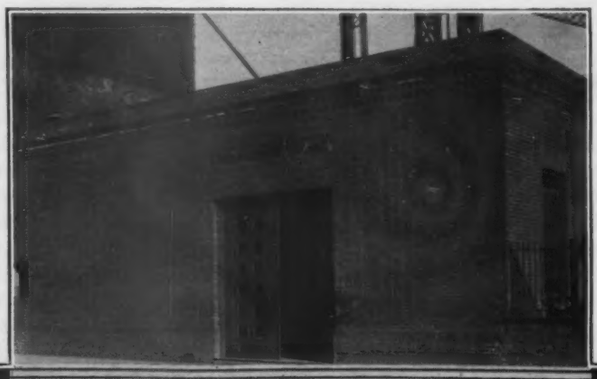
The California Electric Light Company in 1890 had two generating stations, "A" on Jessie Street and "B" at the corner of Townsend and Clarence Streets. Station "A" included steam engines aggregating 1,300 hp., 18 arc light machines aggregating 990 lights of Thompson Houston and Brush manufacture, and three Brush incandescent machines of about 1,000-light aggregate capacity. In addition, there was the usual complement of steam boilers and other auxiliaries. Station "B" included steam engines aggregating 1,850 hp., Brush arc light machines, and the usual complement of boilers and auxiliaries.

The 100-light Brush alternator, when first placed flew apart and J. Ryan, who was filling an oil cup on it at the time, was knocked unconscious to the other side of the dynamo room by the concussion. Part of the armature was embedded in the wall of the dynamo room some 50 or 60 ft. away.

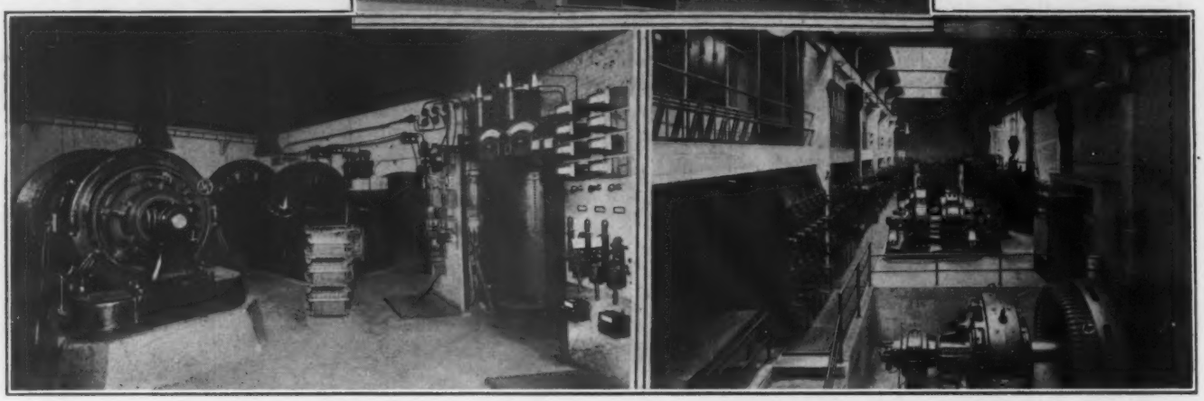
On July 1, 1891, the Edison Light & Power Company was incorporated with 30,000 shares at $100 par valuation each. This company was incorporated primarily because of the activity of what was then known as The Edison General Electric Company which was trying to get a franchise to supply current, making it necessary to come to terms with them or have a bitter fight. Through the efforts of the late Charles R. Lloyd an agreement was reached in New York and a new station was added to the two already in operation and fully equipped with the direct current Edison (three wire) system, which was the system that the Edison General Electric Company would have operated under.

At the time of the consolidation with the Edison interests the old California Electric Light Company ceased operating but was not disincorporated. The new company, the Edison Light and Power Company, was formed with George H. Roe as president and general manager, and F. F. Upton as secretary, taking the place of P. B. Cornwall and Mr. Roe who held respective offices in the California company. The Edison Light & Power Company bought the property of the California Electric Light Company, giving shares of its stock in payment.

(Top) One of the first substations erected by the San Francisco Gas & Electric Company. This station is located on Townsend Street in San Francisco and is now being operated by the Pacific Gas & Electric Company. (Lower left) Station "B" of the San Francisco Gas & Electric Company was one of the early substations constructed to house equipment to distribute current to the electric power users of San Francisco.



(Lower right) Interior of Station "G," Oak and Broderick Streets, one of the modern substations of the Pacific Gas & Electric Company in San Francisco. This company operates many stations similar to this one in which the transmission voltage is reduced for distribution throughout the city.



The first installation at Station "C" was a J. Morton Poole, triple expansion engine of 300 hp. direct connected to two Edison generators. Shortly after this five more engines of this type of double the capacity were added, completing the installation to the year 1900. This station was destroyed by fire on Feb. 22, 1906. The first three-wire underground service furnished by the Edison Light & Power Company was to the old Tivoli Opera House on Eddy Street, the company having to borrow two small Edison Bipolar machines which were run by the Savage engine in Station "A" until the machinery in Station "C" was ready. These machines were started up about 6 p.m. and closed down at 12 p.m., the load being run on the alternating system during the last half of the night and daytime.

In April, 1893, the Western Light & Power Company was incorporated with 5,000 shares at $100 par valuation, all issued, Messrs. A. Bouvier, A. St.J. Bowie, and others being the principals and officers. A small plant located in the basement of the General Keyes building on Stockton Street, corner O'Farrell, was run for two or three years with slight profit, if any, owing to violent cutting of rates by the Edison company, which company finally bought enough stock to gain control.

Many Small Plants Started

On Jan. 10, 1894, the Harbor Light & Power Company was incorporated by Jos. Ough, Wm. Brown and C. E. Whitney, and by several commission merchants who thought there was considerable profit awaiting them in this business. There were 100,000 shares of $10 par value each. The plant consisted of one 150-hp. engine, one 30-light Brush arc machine, one 125-hp. boiler, and was located near the Seawall at the foot of Vallejo Street. The Edison company finally acquired a majority of the stock and stopped operation of the plant.

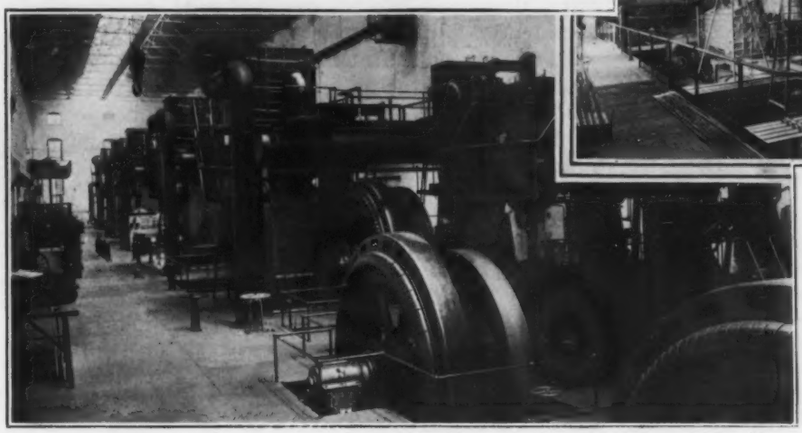
From this time on numerous small plants or plants installed in large hotels and office buildings having surplus power commenced supplying locally to stores, saloons and smaller office buildings, and cut quite materially into the business of the Edison company and the San Francisco Gas & Electric Company, its successor. Among these may be mentioned the Commercial Power Company, Sacramento Street, near Battery; California Hotel, Bush Street near Grant Avenue; Mills Building, Montgomery and Bush Streets; Pacific Power Company, Stevenson and First Streets; Martell Power Company, Fremont Street, between Mission and Howard; Central Light & Power Company, Emporium; and the Standard Electric Company's San Francisco plant, Stevenson Street near First Street.

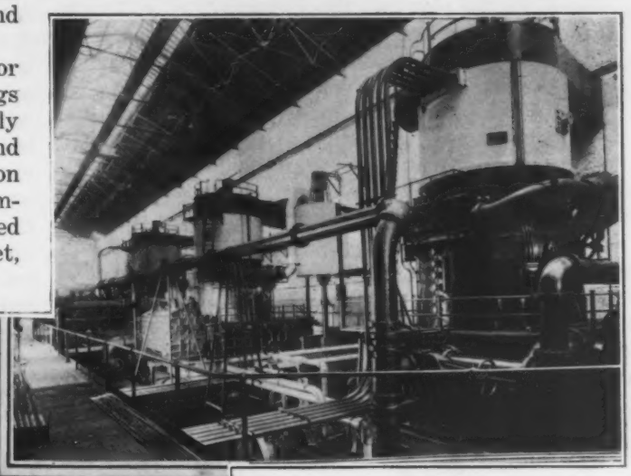
These companies, with the exception of the Mills Building and the Martell Power Company, were subsequently purchased by the San Francisco Gas & Electric Company.

San Francisco Gas & Electric Company Formed

On Dec. 11, 1896, the San Francisco Gas & Electric Company was formed by the merging of the properties of the San Francisco Gas Light Company and the Edison Light & Power Company, operation under the new name commencing Jan. 1, 1897, and 200,000 shares at $100 par valuation were authorized. The electric plant taken over from the Edison company, which was entirely steam generating and with a capacity of about 360 kw-hr. in alternating current generation, 2,800 kw-hr. in direct current generation, and 3,200-engine hp. in arc lamp capacity supplying 3,325 lamps, was added to in generators, engines and large storage batteries, as growth of the business made necessary, until 1903, when the property of the Independent Electric Light & Power Company was purchased.

The generating plant capacity at the end of 1899 was as follows: Station "C" aggregated 3,300-engine hp., with the usual complement of boilers, and included also 400 kw. in Corliss engine driven Edison generators. Station "A" included 360 kw. in Ball engine driven generators. Station "B" included





(Lower left) Interior of Station "A" of the San Francisco Gas & Electric Company with the installation made in 1900. Triple expansion marine-type engines were used to drive a.c. generators.
(Upper right) Steam turbines have been installed in Station "A" to replace the marine-type engines. The equipment pictured above is typical of that now in use in the steam-electric plants of the West.

3,200 hp. in Corliss engine driven Brush and Wood arc machines.

The Independent Electric Light & Power Company was incorporated March 29, 1899, with an authorized stock issue of 100,000 shares at $100 par valuation. It commenced operation on Aug. 1, 1900, with about 5,000 engine hp., driving a.c. Westinghouse generators, and included four substations with a complement of transformers. The transmission voltage was 11,000 volts and was carried underground.

During 1900 the San Francisco Gas & Electric Company added to its station "C" plant 1,200-kw. capacity, to its station "B" plant 975 kw. in steam-driven alternating current, and 200 kw. in direct current. In 1901 there was added to the Fern Avenue substation 500-kw. in motor generating sets and the same capacity in Edison storage battery equipment. In 1902, there was added to the Eleventh and Minna Streets substation, 450 kw. in motor generating sets and the equivalent capacity in Edison storage battery equipment. A corresponding addition was made to the Pacific and Stockton Streets substation in 1903. In 1903 there was added to the Independent Light & Power Company equipment 3,000 kw. in McIntosh & Seymour engines driving Westinghouse alternators.

Prior to the fire of 1906, the Mutual Electric Light Company's plant included 3,000 kw. in engine-driven a.c. generating sets, a 375-kw. motor generator, and a small arc transformer. In 1911 the plant included 4,000 kw. in engine-driven alternators, a 374-kw. motor generator, and the necessary boilers and transformers.

San Francisco Equipment During 1912

In 1912 the plant at the Potrero ("A") station of the San Francisco Gas & Electric Company included 45,500 hp. in steam engine and steam turbine generating sets. The substation equipment at "B" included 800 kw. in motor generators, and a 250-kw. rotary converter. At station "C" there was 6,250 kw. in motor generating sets, and 900 kw. in Edison storage battery equipment. At station "D" there was 2,000-kw. capacity in motor generating sets, arc light and other transformers, and 1,000 capacity in Gould storage battery equipment. At station "E" there was 800 kw. in motor generators, arc and other transformers. At station "G" there were 500 light arc transformers, and 3,000 kw. in a.c. transformers. At station "H" there was 11,000 kw. in transformer capacity. At station "I" there was 2,250 kw. in motor generator sets, and 1,000 kw. in Gould storage battery equipment. At station "J" there was 1,400 kw. in motor generator sets.

Electric rates in San Francisco, because of constant competition, have always averaged less than rates elsewhere in the United States; starting at 20 cents per kw-hr. flat for incandescent lighting in 1890, the general and municipally authorized rates have periodically been reduced.

The original schedule in 1879 provided that service should be provided to arc lights from sunset to midnight at a charge of $10 per lamp per week. This rate was gradually reduced until in 1908 the charge was $5 per lamp per week for 24-hour service. Graduations of this rate were in effect for shorter lighting periods. Incandescent lighting rates were at the beginning 20 cents per kw-hr. and have graded off until they are now 3 to 9 cents per kw-hr. Electric power rates from 1893 to 1900 were 20 cents per kw-hr. with a 40 per cent discount if the bill exceeded $3 per month. Rates are now as low as 2½ cents per kw-hr. for large power users.

Of such were the beginnings of the central station industry. So far as concerns this section of the country the first community to follow the example set by San Francisco was the city across the bay, Oakland. On January 1, 1885, the first electric lighting plant was operated there. It consisted of a 150-hp. Thompson slide valve non-condensing engine, a battery of return tubular boilers and three 25-light arc machines, all housed in a building at Second and Washington Streets. In September, 1888, a Westinghouse alternating machine of 1300-light capacity was installed and a new plant erected on the corner of First and Grove Streets, where now stands the Pacific Gas & Electric Company's steam electric station "C" which, at the present time, has an installed capacity of 44,906 hp.

Station "A," the company's big steam plant at the Potrero in San Francisco, has an installed capacity of 85,791 hp., while the North Beach plant is rated at 36,193 hp. There is, also, a steam electric station on the river bank at Sacramento of 6,702 hp. capacity. So that, at the present time, the steam electric plants owned and operated by "Pacific Service" are of an aggregate capacity of 173,592 hp.

The Pacific Gas & Electric Company has, also, been the pioneer in hydroelectric development. The first hydroelectric power plant of commercial importance in the United States was placed in service by the predecessors of the Pacific Gas & Electric Company in 1895. Its builders not only pioneered the generation of electricity by water power for commercial purposes, but succeeded in transmitting the energy a distance of twenty-two miles to Sacramento at the then record pressure of 11,000 volts. This was the first step in the industrial and commercial development of the West and the nucleus of a hydroelectric generating and distributing system that has today developed into the greatest in the world. Folsom power house is still in operation after nearly thirty years of continuous service, and though relegated to comparative insignificance by the giant plants built in recent years it still continues to pour its flow of energy into the network of transmission lines that extend from one end of the state to the other.

Connected to the "Pacific Service" system today are twenty-eight hydroelectric plants, four steam plants and over two hundred substations, all linked together by thousands of miles of transmission and distribution lines. From a small beginning this company has grown until today its activities extend through thirty-six counties of north-central California, serving nearly two million people with light, heat and power.

Thirty-Four Years of Hydroelectric Development in the West

By Norman S. Gallison

A Chronological record of the major hydroelectric installations in the eleven western states indicates the rapidity of growth of the basic industry of the West.

COMMERCIAL generation of electricity by water power was inaugurated in the West in 1889 with the installation of the Oregon City plant of the Willamette Falls Electric Company. During the next ten years thirty-six plants were established. These plants were small compared with modern plants. They confined their activities almost entirely to lighting, with some few mining installations. Coal and oil were the basis of power for manufacturing purposes and it was not until the beginning of the present century that electricity was used to any great extent for manufacturing purposes. The phenomenal growth of the industry from this time has paralleled the growth of the West.

Every expansion in industry and agriculture has been reflected in the growth of the electrical industry. The increased use of electricity has become a geometrical rather than an arithmetical relationship to the growth of population. The history of the development of hydroelectric power in the West furnishes some of the most romantic pages of its colorful history. It is replete with examples of initiative, ingenuity and daring which have been the marvel of the engineering world. World's records have been established and then surpassed, with regularity; apparently insurmountable obstacles have been successfully overcome, so that today the West leads the world in almost every feature of hydroelectric development.

The San Antonio plant of the San Antonio Power Company, at Pomona, California, built in 1891, was the source of power for the first long distance transmission line — 28 miles at 10,000 volts.

Thirty-five thousand employees are engaged in furnishing electric service in these eleven western states, and the annual payroll of the power companies approaches five millions of dollars. Two million horsepower of installed capacity in hydroelectric plants alone is at the service of one and one-half million consumers. It is estimated that nine billion kilowatt-hours of electrical energy was generated during 1922, and that a billion dollars represents the capital invested in electric systems. Following is a chronological record of the major hydroelectric installations since the inception of the industry in 1889.

Year.	Name of Original Company.	Location of Power House.	Capacity Kw.
1889	Willamette Falls Electric Co	Oregon City, Ore	720
1890	Telluride Power Co	Ames, Colorado	300
1891	San Antonio L. & P. Co	Pomona, Cal	120
1892	Walla Walla G. & E. Co	Walla Walla, Wash	100
1893	Redlands Elec. L. & P. Co	Mill Creek 1, Cal	750
1894	Standard Con. Min. Co	Bodie, Cal	120
1894	Silver Lake Power Co	Silver City, Idaho	500
1895	Utica Power Co	Murphy's, Cal	75
1895	Folsom Water Power Co	Folsom, Cal	3,000
1895	Portland G. E. Co	Oregon City, Ore	5,730
1895	Consumers L. & P. Co	Spokane, Wash	300
1895	Big Cottonwood P. Co	Ogden Creek, Utah	1,800
1895	Manitou Tunnel P. Co	Manitou, Colo	350
1896	Tuolumne Water Co	Knights Ferry, Cal	1,500
1896	Nevada Co. E. P. Co	Rome, Cal	300
1896	Utica Power Co	Murphys, Cal	1,500
1896	Power Development Co	Kern River, Cal	1,350
1896	San Joaquin L. & P. Co	San Joaquin No. 1, Cal	1,050
1896	Big Creek Power Co	Big Creek, Cal	990
1896	Central Cal. Elec. Co	Newcastle, Cal	800
1896	Blue Lakes Water Co	Blue Lakes, Cal	1,350
1897	Nevada County E. P. Co	Rome, Cal	300
1897	Big Cottonwood Power Co	Ogden, Utah	3,750
1898	Telluride Power Co	Provo, Utah	1,500
1898	Central Cal. Elec. Co	Auburn, Cal	500
1898	Yuba Power Co	Brown Valley, Cal	990
1898	San Gabriel Elec. Co	Azusa, Cal	1,500
1898	Santa Ana Canyon Power Co	Santa Ana, Cal	3,000
1898	Missouri River Power Co	Canyon Ferry, Mont	3,000
1898	Tuolumne Water Co	Phoenix Lake, Cal	1,125
1898	Mt. Whitney Power Co	Kaweah No. 1, Cal	1,350
1899	Montana Water & E. Co	Bi-Metallic, Mont	1,350
1899	Redlands Elec. L. & P. Co	Mill Creek 2, Cal	250
1899	Biz Creek Power Co	Big Creek, Cal	300
1899	Yuba Electric Power Co	Colgate, Cal	3,420
1899	Snoqualmie Falls Power Co	Snoqualmie Falls, Wn	7,000
1899	Truckee R. G. E. Co	Farad, Cal	1,500
1900	Butte Co. E. P. & L. Co	Centerville, Cal	800
1900	Walla Walla G. & E. Co	Walla Walla, Wash	300
1900	Yreka Light & Power Co	Yreka, Cal	150
1900	Big Fork Power & Light Co	Big Fork, Mont	450
1900	Butte Lighting & Power Co	Divide, Mont	3,000
1900	Swan Falls Power Co	Swan Falls, Idaho	900
1901	Standard Electric Co	Electra, Cal	10,000
1901	Valley Counties Power Co	Centerville, Cal	900
1901	Truckee, River G. E. Co	Reno, Nev	700
1901	Sierra Power Co	Ontario, Cal	665
1901	The Dalles E. L. & P. Co	Tygh Valley, Ore	1,000
1901	Telluride Power Co	Provo, Utah	1,500
1901	Yuba Electric Power Co	Colgate, Cal	6,000
1901	Missouri River Power Co	Canyon Ferry, Mont	4,500
1901	Pikes Peak Power Co	Beaver Creek, Colo	1,600
1901	Keswick Power Co	Volta, Cal	2,250
1902	Central Cal. Elec. Co	Alta, Cal	3,000
1902	Ontario Power Co	Upland, Cal	750
1902	Spokane Traction Co	Spokane, Wash	1,920
1902	Madison River Power Co	Gallatin, Mont	2,000
1902	Boise-Payette River E. P. Co	Horseshoe Bend, Ida	1,500
1902	Keswick Power Co	Volta, Cal	750

Year.	Name of Original Company.	Location of Power House.	Capacity Kw.
1903	Redlands Elec. L. & P. Co	Mill Creek 3, Cal	3,000
1903	Utah Light & Power Co	Collinston, Utah	1,500
1903	Valley Counties Power Co	De Sabla, Cal	4,000
1903	No. California Power Co	Whitmore, Cal	1,500
1903	Siskiyou Electric Power Co	Lairds, Cal	1,950
1903	Spokane Traction Co	Spokane, Wash	4,580
1903	California Oregon Power Co	Fall Creek, Ore	2,750
1904	Snoqualmie Falls Power Co	Snoqualmie Falls, Wn	10,000
1904	Puget Sound Power Co	Electron, Wash	22,000
1904	American River Power Co	Placerville, Cal	3,000
1904	Telluride Power Co	Logan, Utah	2,400
1904	Mentone Power Co	Mentone, Cal	1,500
1904	Pacific Light & Power Co	Borel, Cal	10,000
1904	Yreka Light & Power Co	Sisson, Cal	360
1904	Seattle Municipal E. L. & P. Plant	Cedar River, Wash	3,000
1904	Rock Creek Power & T. Co	Haines, Ore	300
1904	Valley Counties Power Co	De Sabla, Cal	4,000
1904	Siskiyou Electric Power Co	Klamath Falls, Ore	840
1904	No. California Power Co	Whitmore, Cal	1,500
1905	Trinity River Electric Co	Junction City, Cal	1,500
1905	Mariposa Commercial & M. Co	Bagby, Cal	400
1905	Truckee River Gen. Elect. Co	Fleish, Cal	1,500
1905	Truckee River Gen. Elect. Co	Washoe, Nev	1,500
1905	Telluride Power Co	Grace, Idaho	16,000
1905	San Joaquin L. & P. Co	San Joaquin 3, Cal	3,000
1905	Pacific Light & Power Co	Highgrove, Cal	150
1905	Edison Electric Co	Lytle Creek, Cal	500
1905	Missouri River Power Co	Canyon Ferry, Mont	7,500
1905	Pacific Gas & Electric Co	Electra, Cal	10,000
1905	Mt. Whitney Power Co	Kaweah No. 2, Cal	1,500
1905	Everett Ry., L. & W. Co	Everett, Wash	10,000
1905	No. Mountain Power Co	Canyon Creek, Cal	2,000
1905	Nevada Power & Milling Co	Bishop, Cal	1,500
1905	Pikes Peak Hydroelectric Co	Manitou, Colo	2,250
1905	Oroville Light & Power Co	Lime Saddle, Cal	2,000
1905	Valley Counties Power Co	De Sabla, Cal	5,000
1905	Snoqualmie Falls Power Co	Snoqualmie Falls, Wn	5,000
1906	Holton Power Co	Holtville, Cal	250
1906	Santa Ana Canyon Power Co	Santa Ana No. 2, Cal	1,000
1906	Edison Electric Co	Kern No. 1, Cal	22,000
1906	Washington Water Power Co	Post Falls, Idaho	9,000
1906	Nevada Power & Milling Co	Bishop, Cal	1,500
1906	Animas Power & Water Co	Silverton, Colo	4,500
1906	Oroville Light & Power Co	Coal Canyon, Cal	1,000
1906	LaGrange Water & Power Co	La Grange, Cal	450
1907	Northern California Power Co	Volta, Cal	2,000
1907	Oregon Water Power & Ry. Co	Cazadero, Ore	7,500
1907	Pacific Gas & Electric Co	Colgate, Cal	5,500
1907	Washington Water Power Co	Post Falls, Idaho	2,250
1907	Nevada-California Power Co	Bishop, Cal	1,500
1907	Olympia Light & Power Co	Tumwater, Wash	1,000
1907	Spokane & Inland E. R. R. Co	Rosalia, Wash	7,500
1907	San Joaquin Light & Power Co	San Joaquin No. 1	3,000
1907	Shasta Power Co	Snow Creek, Cal	1,200
1908	Tuolumne Electric Co	Groveland, Cal	1,200
1908	Telluride Power Co	Jordan Narrows, Utah	2,400
1908	Pacific Light & Power Co	Arlington, Cal	600
1908	Pacific Gas & Electric Co	Centerville, Cal	5,500
1908	No. California P. Co., Con	Volta, Cal	2,400
1908	Northern E. L. & P. Co	So. Cow Creek, Cal	1,500
1908	Madison River P. Co	Gallatin, Mont	9,600
1908	Great Western Power Co	Las Plumas, Cal	40,000
1908	Whatcom Co. Ry. & L. Co	Nooksack Falls, Wn	500
1908	Pacific Gas & Electric Co	Deer Creek, Cal	5,500
1908	Arizona Power Co	Fossil Creek, Aris	5,400
1908	Snow Mountain W. & P. Co	Potter Valley, Cal	4,000
1908	Nevada-California Power Co	Bishop Creek, Cal	1,500
1909	Stanislaus Electric Power Co	Relief Creek, Cal	34,000
1909	Portland Ry., L. & P. Co	Cazadero, Ore	3,000
1909	Telluride Power Co	Battle Creek, Utah	5,000
1909	Mt. Whitney Power Co	Tule River, Cal	2,000
1909	Seattle Municipal E. L. & P. P	Cedar River, Wash	8,000
1909	Nevada-California Power	Bishop, Cal	1,500
1909	Snow Mt. Water & Power Co	Potter Valley, Cal	2,000
1909	Great Northern Railway Co	Tumwater, Wash	9,000
1910	Portland Ry., L. & P. Co	Cazadero, Ore	3,750
1910	Telluride Power Co	Olmstead, Utah	9,000
1910	Northern California P. Co., Cons	Inskip, Cal	6,000
1910	Idaho-Oregon L. & P. Co	Ox Bow Bend, Idaho	7,200
1910	Holton Power Co	Holtville, Cal	700
1910	La Grange, Water & Power Co	La Grange, Cal	450
1910	Nevada-California Power Co	Bishop, Cal	2,500
1910	Washington Water Power Co	Little Falls, Wash	5,000
1910	No. California Power Co., Con	So. P. H., Cal	4,000
1910	Montana Power Co	Rainbow, Mont	25,000
1911	Montana Power Co	Hauser Lake, Mont	15,000
1911	Great Western Power Co	Butt Creek, Cal	800
1911	No. California Power Co	Coleman, Cal	15,000
1911	Idaho-Oregon L. & P. Co	Oxbow, Idaho	14,400
1911	Washington Water Power Co	Little Falls, Wash	5,000
1911	Seattle-Tacoma Power Co	White River, Wash	20,000
1911	Nevada-California Power Co	Bishop, Cal	3,500
1911	Roosevelt Dam Power Co	Roosevelt, Aris	3,600
1911	Central Colorado Power Co	Shoshone, Colo	10,000
1911	Central Colorado Power Co	Boulder Creek, Colo	10,000
1911	California Oregon Power Co	Prospect, Cal	4,700
1911	Portland Ry., L. & P. Co	River Mill, Ore	11,000
1911	San Joaquin L. & P. Corp	San Joaquin 1, Cal	9,000
1911	San Joaquin L. & P. Corp	Kern River, Cal	3,000
1912	Portland Ry., L. & P. Co	Estacada, Ore	11,000
1912	Sierra Pacific Electric Co	Verdi, Nev	3,000
1912	Whatcom Co. Ry. & L. Co	Nooksack Falls, Wn	1,500
1912	Pacific Power & Light Co	Naches, Ore	5,750
1913	Mt. Whitney Power & E. Co	Kaweah No. 3, Cal	3,500
1913	Seattle Municipal Plant	Lake Union Auxil	1,500
1913	California-Oregon Power Co	Klamath River, Cal	10,000
1913	So. Sierras Power Co	Bishop No. 3 & 6, Cal	8,750
1913	Tacoma Municipal Plant	Nisqually River, Wn	10,000
1913	Bend Water, Light & Power Co	Bend, Ore	750
1913	Eugene Municipal Plant	McKenzie River, Ore	2,000
1913	Pacific Gas & Electric Co	Drum, Cal	25,000
1913	Northwestern Electric Co	White Salmon River, Ore	12,000
1913	Pacific Light & Power Corp	Big Creek No. 1 & 2	70,000
1913	Montana Power Co	Black Eagle Falls, Mont	3,000
1914	Montana Power Co	Hauser Lake, Mont	3,000
1914	Utah Power & Light Co	Grace, Idaho	22,000
1914	Lewis & Clarkston Dev. Co	Austin Creek	750
1914	Lewis & Clarkston Dev. Co	Pomeroy, Idaho	400
1914	Great Western Power Co	Las Plumas, Cal	12,500
1914	San Joaquin L. & P. Corp	Tule River, Cal	6,000
1915	Granite Power Co	Maxville, Mont	750
1915	Keno Power Co	Keno, Ore	950
1915	Washington Water Power Co	Long Lake, Wash	34,000
1915	Ellensburg Municipal	Yakima River, Wash	550
1915	Western States Gas & E. Co	American River, Cal	1,875
1915	Escondido Mutual Water Co	Bear Valley, Rincon, Cal	600
1915	Arizona Power Co	Fossil Creek, Ariz	1,600
1915	Buffalo Mfg. Co	Buffalo, Wyo	375
1915	Utah Power & Light Co	St. Anthony, Idaho	500
1915	Utah Power & Light Co	Oneida, Idaho	10,000
1915	Main Range Power Co	Polson, Mont	500
1916	Great Western Power Co	Las Plumas, Cal	12,500
1916	Pacific Gas & Electric Co	Halsey, Cal	12,500
1916	San Joaquin L. & P. Corp	Merced Falls, Cal	450
1916	Utah Power & Light Co	Oneida, Idaho	10,000
1916	Montana Power Co	Thompson Falls, Mont	30,000
1916	Montana Power Co	Great Falls, Mont	60,000
1917	Pacific Gas & Electric Co	Wise, Cal	12,500
1917	Snow Mt. W. & P. Co	Potter Valley, Cal	2,000
1917	Pacific Gas & Electric Co	Spaulding, Cal	3,750
1917	City of Los Angeles	San Francisquito No. 1, Cal	28,125
1917	San Joaquin L. & P. Corp	San Joaquin No. 2, Cal	3,000
1917	Nevada-California Power Co	Rush Creek, Cal	5,000
1917	Southern California Edison Co	Fontana, Cal	2,400
1917	City of Los Angeles	River Power, Cal	3,600
1917	Utah Power & Lt. Co	Cove, Idaho	7,500
1917	Telluride Power Co	Panguitch, Utah	50
1917	Montana Power Co	Rainbow, Mont	10,000
1917	Dixie Power Co	St. George, Utah	750
1917	Montana Power Co	Holter, Mont	40,000
1918	California Oregon Power Co	Copco, Cal	12,500
1918	Chelan Falls Power Co	Chelan River, Wash	750
1918	City of San Francisco	Cherry Creek, Cal	3,000
1918	Telluride Power Co	Beaver, Utah	2,000
1918	Idaho Power Co	Swan Falls, Idaho	5,700
1918	Salt River Valley, W. U. A	Mesa, Aris	600
1918	Department of Interior	Yosemite, Cal	2,000
1919	San Joaqtin L. & P. Corp	Crane Valley, Cal	1,000
1919	Washington Water Power Co	Long Lake, Wash	17,000
1919	San Joaquin L. & P. Corp	Plant No. 1A, Cal	425
1919	Puget Sound Pow. & Lt. Co	White River, Wash	20,000
1919	Nevada-California Power Co	Bishop Creek No. 5, Cal	1,850
1919	Ontario Power Co	Ontario No. 2, Cal	500
1919	Idaho Power Co	Lower Salmon Falls, Idaho	2,500
1920	Utah Power & Light Co	Oneida, Idaho	10,000
1920	Okanogan Valley Power Co	Oroville, Wash	2,000
1920	Pacific Gas & E. Co	Spaulding No. 2, Cal	1,000
1920	San Joaquin L. & P. Corp	Kerckhoff, Cal	42,600
1920	City of Los Angeles	Haiwee, Cal	1,050
1920	Idaho Power Co	Thousand Springs, Idaho	6,000
1920	Sinks Hydro Power Co	Lander, Wyo	260
1920	U. S. Reclamation Service	Ft. Laramie Canal, Wyo	900
1921	Pacific Gas & E. Co	Spring Gap, Cal	7,850
1921	Big Springs Electric Co	Moroni, Utah	400
1921	So. Cal. Edison Co	Big Creek No. 2, Cal	17,500
1921	Brigham City Municipal	Brigham City, Utah	1,200
1921	So. Cal. Edison Co	Kern River No. 3, Cal	35,000
1921	Dixie Power Co	St. George, Utah	750
1921	City of Los Angeles	Franklin Canyon	2,500
1921	Uintah Power & Light Co	Vernal, Utah	600
1921	So. Cal. Edison Co	Big Creek No. 8, Cal	25,000
1921	Great Western Power Co	Caribou, Cal	45,000
1921	Pacific Gas & E. Co	Hat Creek No. 1, Cal	12,500
1921	Pacific Gas & E. Co	Hat Creek No. 2, Cal	12,500
1921	So. Sierras Power Co	Adams Aux., Cal	3,000
1921	San Joaquin L. & P. Corp	Kern Canyon, Cal	9,000
1921	Utah Power & Light Co	Olmstead, Utah	5,500
1921	Idaho Power Co	Shoshone Falls, Idaho	10,000
1921	Northwestern Power & Mfg. Co	Port Angeles, Wash	3,000
1922	Pacific Gas & Electric Co	Pit No. 1, Cal	70,000
1922	Northwestern Pow. & Mfg. Co	Port Angeles, Wash	3,000
1922	Pacific Gas & Electric Co	Drum, Cal	12,500
1922	Seattle Municipal	Cedar Falls, Wash	15,000
1922	California Oregon Power Co	Copco, Cal	12,500
1922	City of Los Angeles	San Fernando, Cal	7,000
1922	City of Los Angeles	San Francisquito No. 1, Cal	12,000
1922	Washington Water Power Co	U. Spokane Falls, Wash	10,000
1922	U. S. Reclamation Service	Shoshone Dam, Wyo	2,000

A Thirty-Seven Million Dollar Market in the West

ESTIMATES of the number of new homes to be built in the West during 1923 place this figure in the neighborhood of 144,000. This is based upon figures of actual construction for 1922, which for California alone amounted to 87,000 building permits. That this figure is not exorbitant and indeed, that it does not represent the full number of new customers to be anticipated in the field for electric wiring and appliances is indicated by the record of new customers reported by the power companies, which for 1922 was 102,000 for California and 131,700 for the West as a whole.

In order to estimate what this building activity might mean for the electrical industry in sales of wiring material and current consuming devices during the coming year, figures were secured from various sources on the sale of electric appliances during 1922. Applying a correction average, to include the channels for which figures were not available, it was estimated that $32,874,456 was spent in the eleven western states during the past year to take care of the household needs alone. This was divided as shown in the accompanying table showing expenditures for home equipment.

EXPENDITURES FOR HOME EQUIPMENT
1922 — 11 Western States

Wiring	$11,856,800
Appliances	21,017,656
Total	$32,874,456

This is probably somewhat under the actual figures, but checks very well with the increase in current consumption from household sources during the past year, as this is translated into terms of the increased use of appliances.

There are always those who question the predictions of increased markets on the ground that the saturation point has been reached. This is hardly a factor to be considered in the case of so new an industry as the electrical field, but in any case, it is well to remember that the market for electrical appliances is a constantly expanding one, as represented by the yearly increase in the number of consumers on the books of the power companies. This market for the West is now nearly double what it was in 1916—and shows no tendency toward a lessened growth.

SIGNIFICANT FIGURES ON WESTERN MARKETS

Homes wired for electricity in the West	1,414,200.
Stores and other commercial establishments wired for electricity in the West	289,800.
Power consumers in the West	79,000.
Convenience outlets in average wired home in the West	3.3
Value of appliances in use in average wired home in the West	$150
Sale of appliances and wiring equipment during 1922 in the West	$32,874,456.
Estimated market for appliances and wiring supplies for 1923 in the West	$39,100,000.
Average monthly bill per domestic consumer	$3.36
Or cost per day for use of lights and appliances	.11

RESIDENCE, COMMERCIAL AND POWER CONSUMERS
11 Western States

	Residence	Commercial	Power
1916	854,200	174,300	43,050
1917	940,900	188,700	46,870
1918	1,040,300	203,300	53,030
1919	1,084,800	213,700	56,820
1920	1,172,000	229,800	65,290
1921	1,280,900	259,800	72,000
1922	1,414,200	289,800	79,000
1923*	1,575,000	320,000	86,500

*Estimated.

There are 1,414,200 wired homes in the eleven western states. This represents 83% of the homes in the district served by the power companies, 74% of all homes in the West. In order to ascertain how many appliances are now in use in these wired homes, as well as to afford an indication of the present absorbing power of the average home connected to the power company lines from the standpoint of electrical equipment, the Journal of Electricity and Western Industry sent out a questionnaire to 500 homes in the West asking for a list of the appliances owned, the average monthly electric bill, the number of rooms in the home and the number of convenience outlets. From these records, an estimate was obtained of the number of appliances and their nature, per 1,000 homes, the number of convenience outlets per home, and the average kilowatt-hour consumption. An effort had been made to make the homes selected represent as fair a cross-section as possible of all classes, but it was found on completing the tabulation, that the kilowatt-hour consumption was somewhat higher in the homes from which returns were received than prevails on the average. Applying this correction factor, and checking the results with the record of sales of appliances available within the past few years, it was found that the total value of appliances in western homes was approximately $211,990,400.

The returns indicate an average of $150 in current consuming devices for every wired home in western territory. It is apparent that this figure alone applied to the estimate of 144,000 new homes predicted for 1923 gives a market prediction of $21,600,000 in appliances, a figure which checks very well with that already given for 1922, but which yet does not take into account the purchases which will

be made by old consumers, nor the new consumers who will be developed through the wiring of old residences.

APPLIANCES IN USE AT THE END OF 1922
11 Western States (estimated)

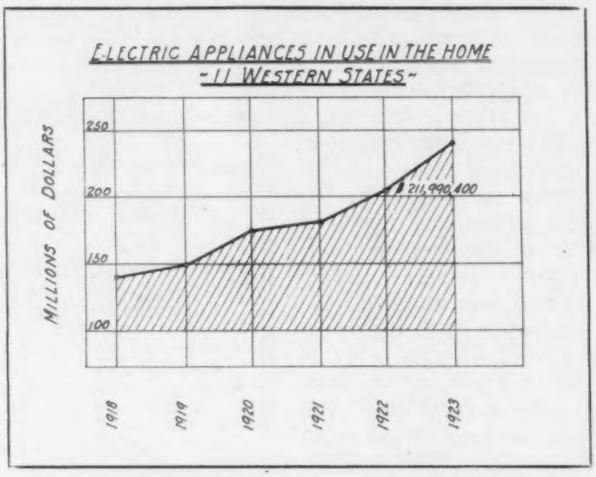
	Number	Value
Washing machines	409,500	$57,330,000
Irons	1,484,600	8,165,300
Ironing machines	65,000	4,875,000
Ranges	87,100	15,242,500
Water heaters	75,000	5,625,000
Cookers	32,500	1,300,000
Dish washers	20,800	1,560,000
Disk stoves	107,900	539,500
Grills	195,000	1,950,000
Toasters	535,900	3,483,350
Percolators	305,800	4,587,000
Waffle irons	292,500	4,095,000
Chafing dishes	75,400	1,131,000
Samovars	32,500	325,000
Mixing machines	32,500	390,000
Milk warmers	42,900	214,500
Air heaters	390,000	4,680,000
Vacuum cleaners	910,000	45,500,000
Fans	372,900	5,593,500
Utility motors	87,100	871,000
Soldering irons	42,900	343,200
Curling irons	227,900	1,189,500
Sewing machines	307,800	18,468,000
Warming pads	248,300	1,986,400
Vibrators	140,000	1,123,200
Violet ray	20,800	312,000
Immersion heaters	20,800	104,000
Hair dryers	65,000	975,000
Toys	87,100	2,613,000
Radio	162,500	12,187,500
Christmas tree lighting sets	763,500	4,581,000
Other electric appliances	30,000	750,000
		$211,990,400

Records of the California Electrical Cooperative Campaign for over 900 homes indicate that the average number of convenience outlets now being installed in California homes is 6.3. The average for the homes replying to the questionnaire was 4, for all wired homes in the West 3.3. A conservative estimate places the increase in outlets in homes now being erected throughout the West over those erected a year ago at 1.5 outlets. Allowing for the increased investment in appliances, which has been shown to bear a definite relationship to the number of outlets in the home, a figure for probable expenditures during 1923 was arrived at. This was checked with the estimated increase in kilowatt-hour consumption in the household field as reported by the power companies of the West, with the following results:

ESTIMATED MARKET FOR ELECTRICAL APPLIANCES IN THE HOME — 1923 — ELEVEN WESTERN STATES

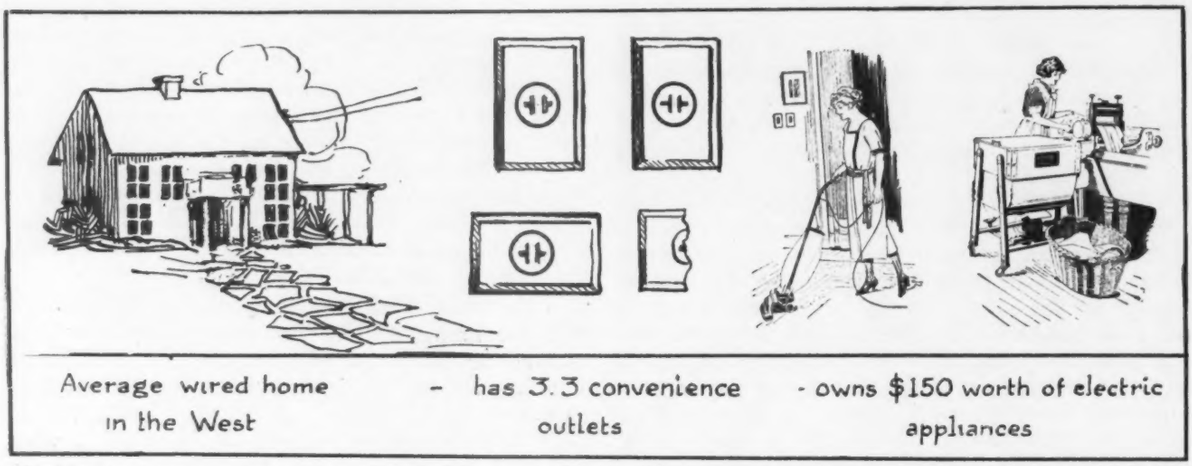
Wiring	$12,900,000
Appliances	26,200,000
	$39,100,000

Translated into terms of equipment, this means that approximately 691,000 convenience outlets, 1,934,000 lighting outlets and 1,105,600 switch outlets will be installed in this territory in the coming year and that something like $7,000,000 worth of electric washing machines, $5,500,000 in vacuum cleaners, $2,000,000 in electric ranges and other equipment in like proportion will find their way into western homes.

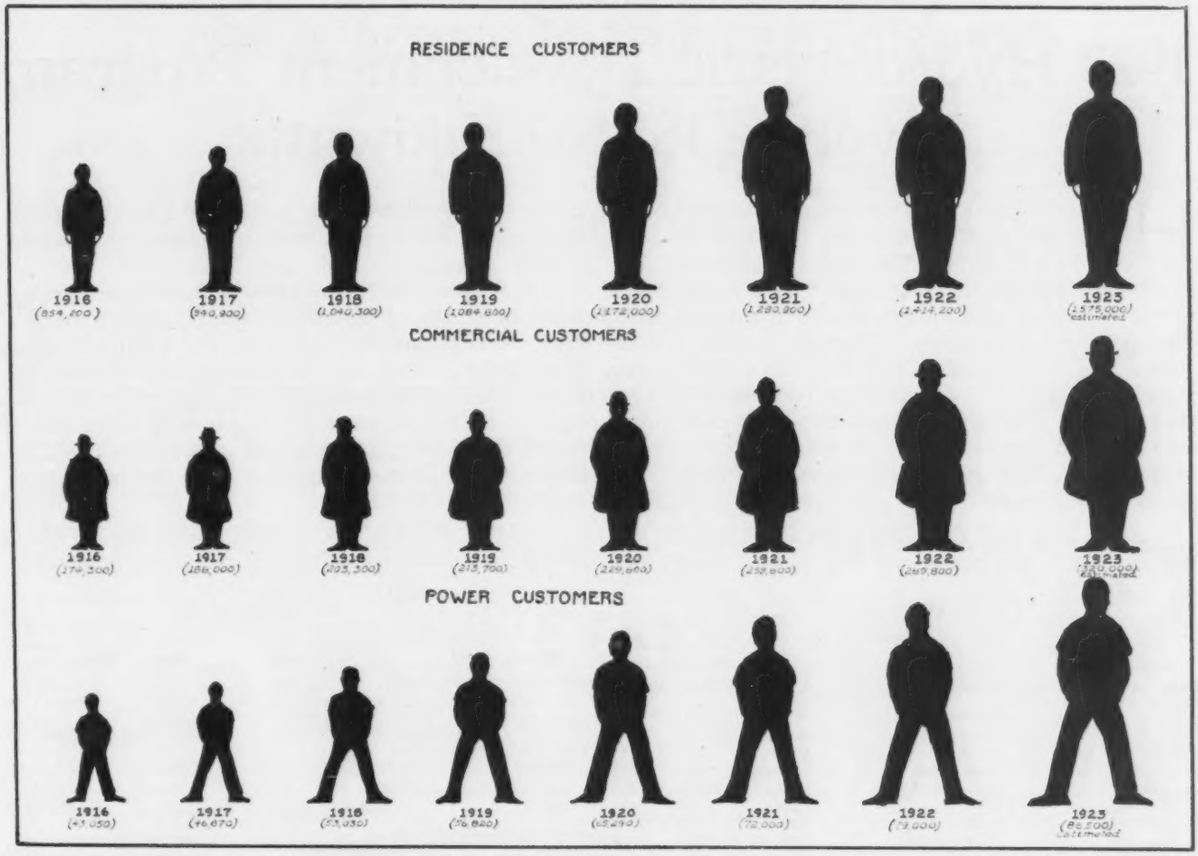


From the estimate of the value of appliances in use in western homes, combined with a record of the number sold during the past five years, the above curve has been established.

The accompanying curve showing the number of appliances in use in the homes of the West indi-



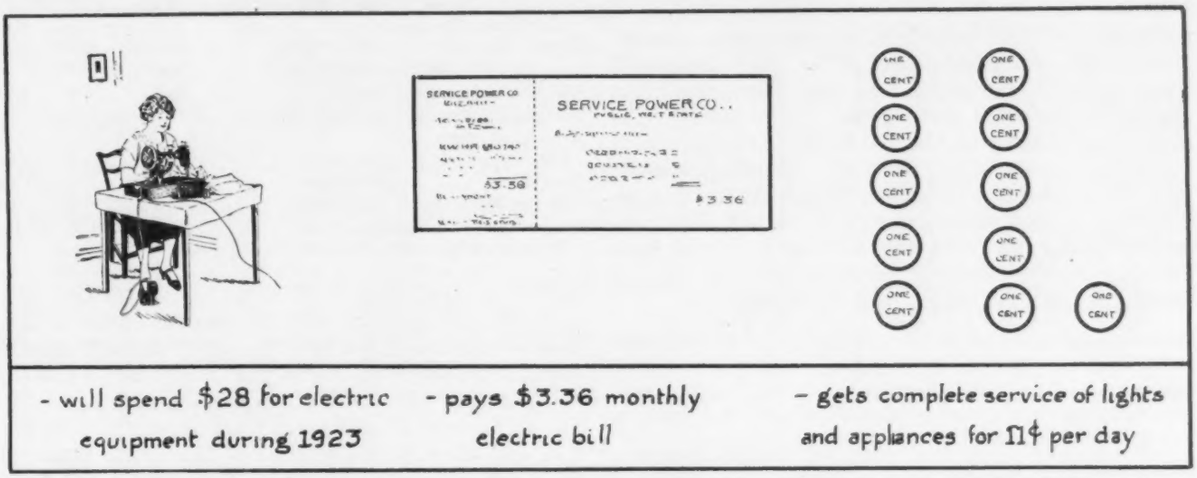
There were 1,414,200 wired homes in the West at the end of 1922, with a prospect of 140,000 additional homes being constructed during 1923



The steady increase in residence, commercial and industrial consumers in the West is indicative of the steadily growing market for electrical equipment in this field

cates that the appliance market may be expected to advance steadily in the future,—that the point of saturation, if any exists, has not been reached. Periods of depression such as that of the past two years, may cause a slight slowing up but increase in population, greater use of electricity due to the educational effects of cooperative campaigns and other agencies, and replacements due to the wearing out of old material or improvements in the design of the merchandise available, are the factors which will be responsible for the steady progress which the future promises.

Electric power has long since ceased to be a novelty in the eyes of the public and the realization has come that the general use of electricity in the home is as essential to modern standards of comfort and convenience as was the substitution of incandescent for oil lamps.


SERVICE POWER CO.
SERVICE POWER CO.
$3.36
ONE CENT
- will spend $28 for electric equipment during 1923
- pays $3.36 monthly electric bill
- gets complete service of lights and appliances for 11¢ per day

With $150 worth of electric appliances in use, the average consumer pays about eleven cents a day for electricity,—one of the smallest items in the household account

1923 Hydroelectric Development Program Involves 185,500 Kilowatts

HYDROELECTRIC power development in the West during 1923 promises to set a new high record with a program which involves 357,725 kw. under actual construction, of which 185,500 kw. will be completed and made available for distribution during the year. A review of the past twelve months shows that a total of 138,675 kw. was added to the generating capacity of western companies in this time. Thus it is evident that the West is leading the world in the utilization of the potential power resources available in the melting snows which cover its mountain ranges.

Assuming that for each kilowatt of power developed, $200 was spent on the plant, dams, and penstocks, $110 on transmission equipment, $100 on distribution equipment and $750 for customers' lamps, motors, appliances and the wiring of homes, offices and factories, an estimate can be made of the capital investment involved both in the program of the past year and that for 1923. Western electric utilities completed a program during 1922 which involved an estimated total of $1,086,750,000. The generating capacity which will be added to the lines during 1923 will represent an investment of approximately $1,466,050,000, divided as follows:

Investment in hydro plants	$ 37,100,000
Investment in transmission equipment	20,400,000
Investment in distribution equipment	18,550,000
Investment in wiring, motors, appliances, etc.	1,390,000,000

While not all of that sum will be spent during 1923 and undoubtedly some of it has already been spent, those parts of past and future development programs which will be completed or undertaken during the year will more than make up for such expenditures.

A further insight into the hydroelectric development program of the West can be gained from a study of the annual report of the Federal Power Commission, which has just been issued. During the fiscal year ending June 30, 1922, the period covered by the report, a total of 26 permits were issued involving primary projects with a total of 546,995 hp. Similarly, 22 licenses were issued by the commission involving 304,835 hp.

The applicants for permits and the projects which they cover, as well as the recipients of licenses, during the fiscal year covered by the Power Commission's report, are printed in the accompanying tables. Two of the most noteworthy hydroelectric plants installed in the West during 1922 are: the Pit River No. 1 unit of the Pacific Gas & Electric Company in Shasta County, California, with a capacity of 70,000 kw., and the 12,500-kw. unit of the Copco plant on the Klamath River in Oregon, installed by The California Oregon Power Company.

PERMITS

Company	Stream	State	Horsepower Primary	Horsepower Installed Capacity
Sound Power Co.	Sultan River and Olney Creek	Washington	71,400	142,800
Big Horn Canyon Irr. & Pwr. Co.	Big Horn River	Montana	97,070	210,000
Hawley, R. W.	Silver Creek	California	44,680	75,000
Wrangell Pulp & Paper Co.	Harding and Grant Creeks	Alaska	1,280	1,500
McDonald, R. G.	Convict Creek	California	2,000	6,250
Baum, Frank G.	Little Colorado River	Arizona	13,400	30,000
Leighton, Joseph B.	Yellowstone River	Montana	7,700	15,000
Ballaine, Frank L.	Kenai River	Alaska	5,500	15,000
So. Sierras Pwr. Co.	Whitewater River	California	2,400	5,000
Haselet, George C.	Silver Lake	Alaska	720	1,500
Mushen & Cronemiller	Deep and Camas Creeks	Oregon	230	800
Elmore Copper Co.	So. Fork Boise River	Idaho	6,000	6,000
Alaska Dev. & Mineral Co.	Anan and Tyee Creeks and White River	Alaska	18,200	28,000
City of Boise	Payette River	Idaho	11,950	30,000
Alaska Pub. Utilities	Power Creek	Alaska	1,000	1,340
Myser & Drach	Fryingpan Creek	Colorado	50,000	100,000
Uintah Pwr. & Lt. Co.	Pole Creek and Uintah River	Utah	2,425	2,425
Town of Petersburg	Crystal Lake	Alaska	1,000	1,000
Wash. Water Pwr. Co.	Columbia River	Washington	120,000	153,400
Portland Ry. Lt. & Pwr. Co.	Clackamas River	Oregon	34,000	88,600
Galvin, John G.	Aarons Creek	Alaska	9,800	12,000
Ft. Klamath Meadows Co.	Anna Creek	Oregon	480	480
Hughes, John H.	French Creek	California	2,160	4,000
Northwestern Elec. Co.	No. Fork, Lewis River	Washington	19,400	24,000
City of Wrangell	Mill Creek	Alaska	500	500
Hutton, McNear & Dougherty	Cascade Creek	Alaska	23,700	34,000

LICENSES

Company	Stream	State	Horsepower Primary	Horsepower Installed Capacity
Alaska Endicott Mining & Milling Company	Lynn Canal	Alaska	350	1,000
Rock Creek Power Co.	Rock Creek	Montana	1,060	1,880
Snow Mountain Water & Power Company	South Fork, Eel River	California	1,440	14,500
Western States Gas & Electric Company	South Fork, American River	California	6,400	8,100
Alaskan-American Power Corporation	Orchard Lake	Alaska	4,620	5,800
San Joaquin Light & Power Corporation	San Joaquin River	California	10,250	45,000
Southern California Edison Company	San Joaquin River	California	55,000	195,000
Eyre, Grace S.	Chalk Creek	Colorado	560	800
Portland Railway Light & Power Company	Clackamas River	Oregon	25,300	30,000
Benefiel, C. S.	Chewaucan River	Oregon	60	60
Wyoming Power Company	Big Horn River	Wyoming	1,300	2,600
Southern Sierras Power Company	Snow Creek	California	850	3,750
San Joaquin Light & Power Corporation	East and North Forks, Kings River	California	161,000	266,000
El Dorado Power Company	South Fork, American River	California	30,000	100,000
Southern Sierras Power Company	High Creek, et al.	California	1,400	4,000
George Inlet Packing Company	Beaver Falls Creek	Alaska	75	90
Cann, J. H.	Cann Creek	Alaska	60	75
Blue Mountain Irrig. Company	Pole Canyon Spring	Utah	40	40
Freshwater Bay Lumber Company	Small stream	Alaska	100	100
Weber, H.	Denny Creek	Colorado	100	100
Karst, Peter F.	Moose Creek	Montana	20	30
Southern California Edison Co.	Kaweak River	California	4,890	9,960

The recipients of licenses and the developments covered follow.

SOME WESTERN HYDROELECTRIC PROJECTS UNDER WAY IN 1922 OR DEFINITELY SCHEDULED FOR 1923

Name of Company	Plant	Location	Present or Proposed Installation kw.	Ultimate Capacity kw.	Static Head (ft.)	Present Stage of Development
Pacific Gas & Electric Company	Pit No. 1	Shasta County, California	70,000	70,000*	454	Completed August, 1922.
Pacific Gas & Electric Company	Drum (third unit)	Placer County, California	12,500	50,000	1,375	First and second units completed 1913, third unit (12,500 kw.), 1922.
Southern California Edison Company	Big Creek No. 3	San Joaquin River	75,000	150,000	855	First unit scheduled for operation Aug. 1923, third unit, Sept., 1923.
Southern California Edison Company	Big Creek No. 1 (third unit)	Big Creek, Fresno County	16,000	64,000	2,131	32,000 kw. operating since 1913, third unit (16,000 kw.) ready July, 1923.
The California Oregon Power Company	Copco (second unit)	Klamath River	12,500	25,000	125	Second unit completed Nov., 1922.
Western States Gas & Electric Company	El Dorado	American River, near Placerville	20,000	80,000	1,900	Fifty per cent complete.
San Joaquin Light & Power Corp.	Mt. King	Merced River	350	Dependent upon future upper development	57	Purchased 1922 from Mt. King Mining Co.
San Joaquin Light & Power Corp.	Balch	No. Fork Kings River	31,000	115,000	2,495	Roads under construction. Tunnel to be under way in 1923.
City of San Francisco	Moccasin Creek	Tuolumne County	80,000	120,000	1,315	Equipment contracted for delivery in 1923.
Department of Public Service, Los Angeles	San Fernando	2 miles west of San Fernando	7,000	7,000	230	Completed, 1922.
Department of Public Service, Los Angeles	San Francisquito No. 1 (fourth unit)	Los Angeles Aqueduct	12,000	48,000	940	36,000 kw. in operation, 12,000 kw. unit added, 1922.
Portland Railway Light & Power Company	Oak Grove	Clackamas River	25,000	75,000	860	Wagon road completed, equipment ordered.
Salt River Valley Water Users' Association	Roosevelt	Salt River, Arizona	7,500	19,250	228	Preliminary plans completed for increasing present capacity of 11,750 kw. by 7,500 kw.
City of Seattle Lighting Dept.	Gorge Creek	Skagit County, Washington	34,500	180,000	375	To be completed 1923.
City of Tacoma	Lake Cushman	Lake Cushman, Washington	45,000	120,000	600	Surveys completed, right of ways purchased.
Washington Water Power Company	Spokane Upper Falls	Spokane, Wash.	10,000	10,000	64	Completed, 1922.
Pacific Power & Light Company	Power Dale	Near Hood River, Ore.	6,000	6,000	180	To be completed April, 1923.
Montana Power Company	Mystic Lake	Bear Tooth National Forest	15,000	15,000	1,100	Roads under construction. Work to start late in 1923.
Utah Power & Light Company	Grace	Grace, Idaho	11,000	44,000	525	Fourth unit being added to present 33,000 kw. capacity. Practically completed.
Utah Power & Light Company	Olmstead	Provo, Utah	5,500	12,700	369	5,500 kw. unit added during 1922. Former capacity 7,200 kw.
Utah Power & Light Company	Soda	Alexander, Idaho	15,000		85	Under construction.
Pacific Mills Ltd.	Ocean Falls	Ocean Falls, B. C.	4,700		140 (Av.)	
City of Eugene	McKensie	McKensie River, Ore.	1,500		50	Bids received, contracts to be let immediately.
San Gorgonia Power Company	No. 1	San Gorgonio River, Cal.	1,750	1,750	1,775	Hydro equipment contracted for. Work under way.
San Gorgonia Power Company	No. 2	San Gorgonio River, Cal.	775	775	900	Hydro equipment contracted for. Work under way.
Yuba Development Company	Bullard's Bar	Yuba River, Cal.	8,000	16,000		Work started on plant and dam to be completed 1923.
Modesto-Turlock Irrigation District	Don Pedro	Tuolumne River, above La Grange	15,000	70,000	160 to 240	Dam completed, plant to be in service early in 1923.
Merced Irrigation District	Exchequer	Merced River, Cal.	25,000		310	Preliminary work under way.
Electro Metals Corp.	No. 1 No. 2	Klamath River		67,000 17,000	250 75	Surveys and preliminary plans completed.
British Columbia Electric Railway, Ltd.	Stave Falls (fourth unit)	Ruskin, B. C.	8,825	35,400	110	Fourth unit added during 1922.

*Total for Pit River approximately 450,000 kw.

The Pacific Coast Superpower Zone

COULD a kilowatt be isolated at Yuma, Ariz., equipped for travel with a through ticket and a clear line, it would be possible to transfer it to Albany, Ore., over approximately 1,200 miles of copper, comprising the backbone of a superpower system whose annual kilowatt-hour output is almost one-tenth the total annual consumption of electrical energy in the United States, and whose network of transmission and distribution lines exceeds half the total railway mileage of America. While the East has been talking and agitating a superpower system in the Boston-Washington district, western public service companies have gone quietly about the business of interlinking their lines until at the present time there has been built up an interconnected network which covers three states and which, within the next eighteen months, will cover the entire Pacific Coast, from the Mexican border to Puget Sound.

The Pacific Coast Interconnected Transmission System at the present time comprises all of the major California power companies and two of the important Oregon utilities. Plans are now under way for the closing of the two remaining gaps in the Pacific Northwest and when this is done there will then exist a superpower system whose main trunk will be approximately 1,800 miles long, whose generating capacity, both steam and hydroelectric, will be 1,640,170 kw. and whose annual output will be 5,779,607,297 kw-hr. Were this system to be transposed to the Atlantic seaboard, it would serve a territory extending from Quebec, Canada, to Charleston, S. C.

The lines of the system cross barren deserts, traverse fertile valleys and wooded hills, and finally climb through a pass in the Sierras to carry power to the Nevada mines. They are fed by steam plants fired with oil and natural gas, hydroelectric plants whose generators are turned by waters from the eternal Sierra snowbanks or from the never-diminishing springs of the Pit River. Even the vagaries of nature are overcome, for in years when rainfall is light in the South and water scarce, power can be sent from the Northwest to make up the resulting shortage.

Economy and the lack of power to supply peak demands have been two of the principal reasons for the interconnecting of the lines of the western companies. Hydroelectric energy has been plentiful and comparatively cheap but it is essential now that greater use be made of the investment in electric public utilities, for the time is not far distant when the demands for service will far exceed the ability of the industry to command the necessary funds with which to provide that service. Efficiency in the use of money is as desirous and necessary as economy in the use of fuel, oil and water, and the public has come to demand that the industry show the same skill in the use of one as in the other. It is evident then that the problem facing the electric public utilities is most broad and embraces the conservation of fuel, water, labor, money, materials and human endeavor. In a measure, interconnection embraces all of these and most of the advantages to be gained by it have already been demonstrated by those western companies whose systems have been linked.

The beneficial effects of interconnection may be summarized as follows:

1. Interconnection makes possible the fullest utilization of water powers and watersheds through exclusive hydroelectric systems or in hydroelectric systems possessing steam-electric auxiliaries. Advantage can also be taken of the diversity existing between watersheds and water storage.

2. Interconnection increases the load which may be carried on otherwise separate systems owing to diversity of peaks, the increase ranging from 15 to 30 per cent.

3. Interconnection enables a generating system to operate with less equipment in reserve, and in some cases no reserve need be provided, for the system is sufficiently large to care for any demands which might be made on it.

4. Fuel can be saved in considerable quantities on steam-electric systems which are tied-in with hydroelectric systems.

5. Interconnection makes possible a greater utilization of an investment by providing for a load for the equipment before the local market can absorb it. One year one system may have a surplus, owing to the installation of new equipment, and the next year the situation may be reversed with the neighboring company possessing the surplus.

While the western utilities which comprise the interconnected system have enjoyed many of the above advantages, the interchange of power has been practically limited to adjoining companies, whose transmission lines are linked. To gain the maximum benefits, the interconnections must be made on a grander scale with tie lines and switching equipment at junction points of sufficient capacity to allow the transfer of large blocks of power from one company to another whose lines are not adjacent, the transfer being made over the wires of a third company. The flexibility attainable by means of such interconnections amply warrants the practice.

Some idea of the immensity of the present interconnected system existing on the Pacific Coast can be gained from the figures it involves. The present system includes the lines of eleven major companies, and one municipality, involving a total steam generating capacity of 402,150 kw., and a hydroelectric generating capacity of 839,990 kw. The annual output of the system for the year ending Dec. 1, 1922, was 4,330,640,821 kw-hr. The companies which contributed to this output and the amount of power generated by each follow:

	Kw-hr.
San Diego Consolidated Gas & Electric Co.	67,836,308
Southern California Edison Co.	891,334,000
Southern Sierras Power Co.	187,827,750
Los Angeles Dept. of Public Service	242,787,000
Los Angeles Gas & Electric Co.	91,270,995
San Joaquin Light & Power Corp.	447,000,040
Pacific Gas & Electric Company	1,599,325,067
Great Western Power Company	553,066,470
Snow Mountain Water & Power Co.	52,082,080
Western States Gas & Electric Co.	29,817,160
California Oregon Power Co.	133,700,038
Mountain States Power Co.	34,593,913

At the present time there are two gaps, as shown in the accompanying map, existing in the system which must be closed before the lines of the Pacific Northwest will be tied-in with those of California. There is a transmission line at the present time between Springfield, Ore., and Salem, which is the property of the Oregon Electric Company, and which operates at 33 cycles. The lines of the Mountain States Power Company and The California Oregon Power Company, which are joined at Springfield, both operate on 60 cycles. The Oregon Electric Company, which receives its power from the Portland Railway, Light & Power Company, is installing twelve automatic substations which will operate on 60 cycles, and upon the completion of this installation, it is planned to interconnect with The California Oregon Power Company at Springfield.

The second gap exists between two of the divisions of the Pacific Power & Light Company. Surveys are being made for a line along the banks of the Columbia between The Dalles and Umatilla and officials of the company predict that the line will be completed within the next eighteen months. When these two gaps are closed there will be added to the interconnected system 99,815 kw. in steam generating capacity and 298,215 kw. in hydroelectric generating capacity. The total capacity of the system, exclusive of additions which are scheduled to be made during the next year, will then be 1,640,170 kw., both steam and electric. The annual output will then be 5,779,607,118 kw-hr. The companies of the Pacific Northwest which will contribute to the total have produced during the year ending Dec. 1, 1922, the following amounts of power:

	Kw-hr.
Puget Sound Power & Light Co.	464,571,297
City of Tacoma	104,471,074
Washington Water Power Co.	402,967,000
Pacific Power & Light Co.	39,662,326
Northwestern Electric Co.	117,864,900
Portland Railway, Light & Power Co.	319,429,700

Interconnection, then, as far as the Pacific Coast is concerned, is an accomplished fact. Quietly, without the blare of trumpets, there is being built up a superpower system which eclipses anything in the world, — a system which will serve four states and a population of approximately 5,560,871.

PACIFIC COAST INTERCONNECTED SYSTEM

Feeding a portion of three states, the interconnected transmission lines of the Pacific Coast central stations comprise a superpower system that has no equal in any part of the world.

Outlook for Electrical Industry in the West for 1923

A symposium of the views of leaders of each branch of the industry indicates that 1923 will mark a new era of electrical progress in the West.

IN ORDER to present to its readers a forecast of the electrical industry in the West for 1923, the Journal of Electricity and Western Industry directed a questionnaire to a selected list of leaders in each branch of the industry. While specific questions were propounded, those addressed were requested to express their views also on any other phase of the electrical industry which they considered to be of sufficient importance to warrant special attention.

The subject matter following discusses the outlook from the viewpoint of the central station, the manufacturer and jobber, the manufacturers' agent, the contractor-dealer and cooperative campaign.

MANUFACTURERS AND JOBBERS

What will be the channels through which electrical appliances will be distributed in the future?

J. I. Colwell, manager supply department of the Western Electric Company at Seattle, writes that his company has made many attempts to create a market for electrical appliances that would be great enough to satisfy all jobbers and manufacturers of electrical appliances. He believes that there has been an attempt to force the purchase of electrical appliances too fast. When the housewife who does her own work hears the door bell ring she is inclined to say, "There's another vacuum cleaner salesman." She has been solicited vigorously to purchase vacuum cleaners and other appliances at a time when conditions were not prosperous enough for her to purchase, even though she had the desire, and while times are now becoming better, a certain resistance has been created against the purchase of appliances through the "door to door" method. In his opinion electrical appliances in the future will be sold through electrical dealers, housegoods furnishing stores, department stores and central stations.

T. W. Simpson, vice-president of the Federal Electric Company of San Francisco, expresses a similar opinion to that of Mr. Colwell. He believes that the future will show that electrical appliances will be distributed by contractor-dealers, specialty dealers concentrating on one line, central stations, and hardware, house furnishing and department stores. He believes that the electrical appliance field is far from saturated and that it now lacks sufficient points of contact with the purchasing public. It will do no harm to any branch of the industry to have all agencies mentioned above selling appliances. On the contrary, it will do a great deal of good because all will be engaged in selling the appliance idea to the public and this will reduce the sales cost to all concerned.

Carl E. Heise, district manager for the Westinghouse Electric & Manufacturing Company of San Francisco, differs, in that he believes that the contractor-dealer may become the principal channel of distribution. Mr. Heise states that during the last few years, the electrical contractor-dealer has established himself as a merchandiser in addition to his capacity as a mechanic, with the result that merchants in other lines can learn much from him. However, the contractor-dealer must realize his responsibilities as a merchant. This calls for central business locations with well kept stores, attractive window displays, and suitable stocks of nationally known products backed by responsible manufacturers. Consistent following of such a policy should insure the electrical contractor-dealer's becoming the main channel of distribution for all electrical merchandise.

A. S. Moody, assistant Northwestern manager for the General Electric Company at Portland, Ore., believes that the electric appliance is becoming more and more a standardized article of merchandise and as such is being distributed through the general retail merchants of household articles, such as hardware stores and department stores. The tendency to buy household articles at such stores is a natural one. To counteract this trend, it is necessary for the electrical retail stores to make their service on appliances superior to that of the more general outlets, and at the same time to bring their merchandise methods at least up to a par with the hardware and department store. This action is imperative if they expect to maintain their position as distributors of electric appliances.

What part should the central stations play in the marketing of appliances?

J. I. Colwell believes that the central stations, when they market appliances at a profit and follow the market in their selling prices, stimulate the sale of appliances and help the business of other dealers and stores. Where the central stations do not sell appliances at a profit and follow the market, they are not doing a constructive work and they jeopardize the existence of the electrical dealer. This they cannot afford to do.

T. W. Simpson expresses the opinion that central stations should actively operate electric shops but that they should be under the direct supervision of an official who will not permit it to take advantage of competitors due to the weight of authority that goes with the central station name. It it were not

for overzealousness on the part of many managers of central-station electric-shops, this whole agitation as to whether or not the central station should engage in merchandising would never have started. The principles governing a central-station electric-shop should be, (1), selling at prices to make profit, (2), concentrating on one make of article in each division of the appliance field so that other dealers may take exclusive contracts with the other makes, (3), extending to its dealer friends in the same town the advantages of its mailing list and of its collection facilities, (4), by means of advertising and outside solicitation, undertaking the chief burden of selling the idea that electrical appliances are useful and desirable.

In the opinion of **A. S. Moody,** is is the part of the central-station to pioneer electric appliance distribution. The exploitation of new appliances, which entails considerable expense, cannot be borne on the margin of profit obtained by the electrical dealer, and consequently such new devices, in order to obtain quickly the results desired, must be pioneered by the concern which is most vitally interested in their exploitation—i.e., the central-station.

What solution can you offer for the problem of servicing household electrical appliances?

J. I. Colwell considers that the servicing of electrical appliances should be taken care of by the central-station, housegoods furnishing store, department store or by the electrical dealer himself. Where the company that sells the appliances maintains a servicing department it means that that company, because of its experience in servicing, has a better knowledge of the appliances themselves. This eventually brings about the more intelligent selling of the appliances. Where the appliances are intelligently sold the servicing of the appliances is reduced to a minimum, because most of the need for servicing of appliances is due to the fact that the purchaser does not properly understand them and was not properly sold when he first purchased the appliances.

T. W. Simpson says that the best solution is that at Salt Lake where the central station operates a "fix-it" department where all makes of goods, whether sold by the central station or by dealers are repaired for a nominal charge. This is the best means of preventing what has been called the "shelf connected load."

Carl E. Heise believes that it is to the interest of the central station to see that appliances are maintained in usable condition at a minimum expense to the consumer. While the manufacturer and distributor are vitally interested, it is probable, because of the more frequent and intimate contact between the central station and the consumer, that the central station should take the lead in the solution of this problem.

A. S. Moody states that the solution rests not in placing the burden on any one of the agencies exploiting their sale, but it should be handled jointly. The principal advantage of the electrical retail merchandiser over his technical competitor is his familiarity with the construction and use of appliances. He can sell more intelligently, and service more intelligently, than the general retail dealer, and he should capitalize this argument in maintaining his position in the retail field.

The central station must do its part to assist in servicing and the manufacturer should provide in the principal centers, if not a service station, at any rate a stock of repair parts which would be quickly available to avoid delay in effecting repair.

Is the present cost of distribution of electrical appliances too high and, if so, how can it be reduced?

J. I. Colwell does not believe that the present cost of distribution of appliances is high and believes that the dealers should have a profit large enough to make it worth putting forth enough sales effort to get a substantial volume of sales. Satisfactory service by the dealer is a factor in increasing his sales.

T. W. Simpson expresses the opinion that the present cost of distribution is too high and it can be reduced if the central station will operate sample electric stores on sound business principles and undertake the main duty of selling the idea, leaving it to electrical stores and dealers to sell the particular device.

A. S. Moody believes that the distribution cost of electrical appliances at present is not excessive, particularly in comparison with marketing costs of similar electrical commodities. Some distributors of household goods do not handle certain electrical devices because the margin of profit is less than their cost of doing business. When the technical nature of the business is considered and taking servicing charges into consideration, he does not feel that the distribution cost of this material is excessive.

What is the outlook for an enlarged market for electrical appliances and apparatus for 1923?

J. I. Colwell states that the present indications are for a better market for electrical appliances and apparatus in 1923 in the Pacific Northwest. The lumber business is the backbone of the Northwest and because of the building program throughout the country for this year the lumber business is sure to be prosperous.

T. W. Simpson believes an enlarged market can come only from enlarged consumption.

A. S. Moody says that in his opinion the market available for electrical appliances in the year 1923 will exceed that of any year with the possible exception of 1920, in which year the manufacturers were unable to supply the demand, and it is his opinion that this year will see somewhat the same conditions in that the manufacturers will be considerably oversold.

CENTRAL STATIONS

What steps are you taking or planning to take to market your surplus power, developed or in process of development?

R. E. Fisher, vice-president in charge of sales for the Pacific Gas & Electric Company, San Francisco, states that 1923 will see a more intensive and

concerted effort on the part of his company toward creative sales through the rise of high class technical sales engineers, who will develop new uses for electricity, and use every endeavor to load up existing facilities. The major undertakings will be illumination, industrial applications of electricity for heating, and an intensive electric range campaign with a bogie of 2,500 ranges for the year.

A. C. McMicken, sales manager of the Portland Railway, Light & Power Company, Portland, Ore., states his company now has under way the development of its sixth hydroelectric generating plant, this development being known as the Oak Grove project, which by the summer of 1924 will give an additional 25,000 kw. 365 days a year. Additional units of the Oak Grove project will be developed as needed until an ultimate capacity of 100,000 hp. continuous power has been developed. At the present time they have no surplus power in the strict sense of the word, but are able to take care of their rapidly growing load by the purchase of power and by the addition of steam auxiliaries before next low water season.

A. W. Childs, manager commercial department, Southern California Edison Company, writes from Los Angeles that "the plans of the Southern California Edison Company for new business development during 1923, are based upon signing a minimum of 100,000 hp., in additional lighting, cooking, heating and power. This will mean an increase of approximately 15 per cent in connected load. There is every reason to believe that the large industrial, commercial and residential development realized in California in 1922, will continue undiminished during 1923. A careful survey of business possibilities in the 28 districts in central and southern California served by the Southern California Edison Company, shows that there is a ready market for this large amount of power."

W. R. Putnam, vice-president and general manager of the Idaho Power Company, Boise, Idaho, states that "the territory served by the Idaho Power Company is dependent primarily for its prosperity upon agricultural conditions. The year 1922 has shown a slight improvement over 1921, but so-called normal growth of this territory cannot be reached until the buying power of the farmer has been restored either by an increase of approximately 50 per cent in the price levels of his products or with a corresponding reduction in the cost of goods which he necessarily purchases, or a combination of increase in the price of his products and a reduction in his costs sufficient to obtain the same end."

He anticipates that the year 1923 will show considerable progress in this direction, with the resulting improvement in business conditions in his whole territory. He expects that business will show an increase between 10 and 15 per cent over 1922.

H. J. Gille, sales manager of the Puget Sound Power & Light Company, Seattle, Wash., writes that he does not think it is good business to talk of marketing surplus power unless in fact he means literally surplus power. Unlimited power service over and above the present power station load up to power station capacity should not be classed as surplus power for the reason that, "I think it creates an erroneous impression in the minds of prospective customers." The market for real surplus, such power as is available outside of the hours each day or the hours in the year when the service is not used by regular customers, is a rather difficult business to develop, depending, of course, on what available market there may be for such surplus. The market for this in the Pacific Northwest is rather limited.

What steps are you taking to stimulate consumer ownership?

A. C. McMicken writes, "The company has been selling since Jan. 1, 1922. 7 per cent prior preference stock and maintains and operates its own investment department for the sale and resale of its securities. It is our desire and idea to do all our junior financing as much as possible through the sale of prior preference stock to our consumers and people living in the territory we serve."

F. L. Greenhouse, securities agent for the Southern California Edison Company, writes from Los Angeles, "We expect to continue our campaigns as in past years and for 1923 expect to add, approximately, 18,000 new stockholders to our present list of 49,000 stockholders. The security which we will offer this year will be our 7 per cent cumulative preferred stock at an initial price of $105 per share cash, or $106 on the installment plan. As market conditions warrant, the price of this stock will probably be increased from time to time. The method used for the sale of this stock will be the same as in the past, namely, the sales will be made by the employees of the company direct and without the intermediary of any brokerage or bond houses whatever."

W. R. Putnam says, "During the past year, without any active campaign, we have secured better results as to increase in customer ownership of our stock than at any time during the several years in which we have quietly placed our preferred stock with our customers. Our success in this particular, while not representing sales of large amounts of stock, has so encouraged us that in the early spring we will start an active campaign for customer ownership. In the Pocatello division of our territory, we are planning to install two 6,000-kw. outdoor-type units. On our interconnected system we plan to extend our main transmission line now extending 114½ mils from Thousand Springs to Caldwell, on from Caldwell to Ontario, Ore. This extension will be built for 132,000-volt operation, but, temporarily at least, will operate at 66,000 volts."

H. J. Gille says, "We propose to continue during the next year our campaign of customer ownership that we have had in the past."

Are you considering the inauguration of a special campaign to increase the use of electricity in the home? What steps do you plan to take during 1923 to popularize electric cooking?

R. E. Fisher states, "We are considering special measures to increase the use of electricity in the home, primarily for electric range and water heating."

A. C. McMicken writes, "We have not contemplated any special campaign to increase the use of electricity in the home other than an intensive campaign to sell electric ranges and water heaters. The total kilowatt-hours used in the home has increased approximately 73 per cent in 1922 over the year 1918. During this year we will conduct, with the cooperation of range manufacturers, electric cooking schools, while advertising in various ways the advantages of electric cooking. Following out the precedent established during 1922, we will send to every home builder suitable letters and literature pointing out the necessity for complete and proper wiring in new homes and the advantages of electric cooking. We are optimistic over the future of electric cooking in the territory we serve and we now have in service approximately 2,000 electric ranges."

A. W. Childs states that the sale of household labor saving devices will be handled largely by the electrical contractor-dealers with the Southern California Edison Company lending active support and cooperation. The electric ranges and water heaters will likewise be sold by the electrical contractor-dealers, but the Edison company will also devote considerable energy and time to selling to its consumers, the idea of cooking by electricity. Electric range salesmen will cover the field in a systematic way, easy terms of payment will be allowed, and the company will assist the contractor-dealer in financing the sale and installation where necessary. Illumination will be given considerable attention, including better lighting of homes, stores and factories, display windows, flood lighting, electrical advertising and street and highway lighting. All departments of the company are cooperating in making 1923 a banner year in new business signed.

H. J. Gille says, "I feel that by far the largest opportunity for any one class of service to develop increased business is in electric cooking and we have plans under way for prosecuting an electric cooking campaign in 1923."

CONTRACTOR-DEALERS AND COOPERATIVE CAMPAIGNS

What can the contractor-dealer do to get his share of the prosperity which 1923 promises?

How can the contractor-dealer play a leading part in the spreading of the electrical home idea?

How can the evil of destructive competition be overcome?

Responses were general; in fact, they indicated that the questions were so closely allied to one another as to be practically one.

S. W. Bishop, executive manager of the Electrical Cooperative League, Denver, Colo., writes, "In the Rocky Mountain region and in Colorado especially, industrial projects and building activities started during the past year promise a continuation and an increase. The unprecedented building boom of 1922 in Denver has given a strong feeling of optimism which thus far even winter weather has been unable to dampen.

"All agree, however, that the real test of business in any line is not volume by itself but rather the profit exacted from it and here is where the electrical industry can rehabilitate itself during the next eleven months. With plenty of business to go round, from the present viewpoint, it would seem that there is ample time to decide on getting a profit. A definite policy of this character will work wonders for manufacturer, jobber, and contractor-dealer alike."

Rey E. Chatfield, secretary-manager of the Electrical Service League of British Columbia, Vancouver, B. C., says, "Building activity in British Columbia up to the present time has been confined to home construction, but beginning the new year of 1923 larger projects will be started. Already this year the drawing of plans for over $5,000,000 worth of construction has been authorized, with the probability of this total reaching at least $20,000,000. This new construction will benefit the electrical industry, and primarily the contractor-dealer. For example, the central station has authorized the expenditure of over $1,500,000 for construction purposes for the new year. This includes a high tension line to supply the Britannia Mining & Smelting Company, Ltd., with a 5,000-hp. service. The new high tension line opens up considerable new territory not yet served by central station lines; notably, the municipality of West Vancouver, with some 900 homes in the first district to be served.

"Construction will start on grain elevators, a large flour mill, office buildings and several apartment blocks. The Canadian Pacific Railway Company is opening a new tract of land for subdivision into building lots, and will offer long term payments on loans for the erection of medium priced homes.

"The evil of curbstone competition has been largely overcome through the absorption of many of the curbstones by the larger contractor shops and by the education of the small contractor desiring to remain in business for himself, to the point where he finds it advantageous to do less business and make a profit on the work he does. To my notion, the electrical contractor in British Columbia, and particularly in Greater Vancouver, faces the most prosperous year since the War."

Earl Browne, president of the California Association of Electrical Contractors and Dealers, San Francisco, Calif., says, "All three queries can be answered by the word WORK, but as you say, 1923 only holds out promises, hence speaking individually and unofficially, don't let us 'Coue' ourselves into imagining something is, that isn't."

MANUFACTURERS' AGENTS

What are the obstacles confronting the manufacturers' agents at the present time?

J. G. Pomeroy, of Los Angeles, writes, "The obstacle confronting manufacturers' agents at the pres-

ent time on the Pacific Coast is stock. It may be we are too far from the source of supply and business, nearer factories are getting the preference. I think the first six months' business in 1923 in California, Washington and Oregon will be the largest in the history of the electrical industry."

L. Brandenburger writes from Salt Lake City, "The manufacturers' agent should be considered as true a representative of his principals as though he were working exclusively for one manufacturer and being paid a regular salary by such manufacturer. That some purchasers do not consider him in such a light, that some manufacturers do not look upon him in the same relation as their salaried officers and that some manufacturers' agents do not conduct their operations in such a way as to bring about the impression that the proper relations exist between him and his principals, introduce obstacles in the way of his creating more business for the manufacturer and enlarging the markets in which the consumer can intelligently buy.

George A. Gray, of Geo. A. Gray Company, manufacturers' representatives, San Francisco, Calif., gives as his opinion, "The only real obstacle is a lack of opportunity for orders at a profit, and surely there is a greater opportunity for orders now than for a long time. Eastern markets have improved wonderfully, surplus stocks have disappeared and in their place are large back-order lists. This means that the dumping of much overstock and inferior material will cease, has ceased, as a matter of fact. Further, the railroad freight embargoes make the prompt and satisfactory movement of small lot shipments practically impossible, eliminating the type of agent who has nothing to lose but the commission on an order which he takes direct and no business responsibility beyond the necessity of earning his keep."

Will anything hinder the manufacturers' agent from making prompt deliveries during 1923?

Are the present freight rates satisfactory and what is the situation relative to ocean shipments?

Do collections and credits promise to be satisfactory during 1923?

J. G. Pomeroy says, "Many things will hinder the manufacturers' agent from making prompt delivery during 1923. The present all-rail freight rate to the Pacific Coast is too high. Water shipments are hindered on account of docking facilities in Boston, New York and Baltimore on the east coast and docking facilities in Los Angeles harbor. Collection and credits will be perfectly safe during 1923 to those who are selling the jobber. I think the electric contractor and dealer as a credit risk will improve, owing to the excellent educational work that is being done by the cooperative campaign."

L. Brandenburger gives as his opinion, "The manufacturers' agent looks forward to considerable increased business in 1923. Both factory shipments in 1923 and deliveries by the carriers should improve. As the manufacturer approaches normal capacity his shipments become more dependable. Although deliveries from points west of the Mississippi River have not suffered to the degree that shipments from east of the Mississippi River have, the expected improvement in railroad conditions will improve all deliveries. The present freight rates to the Intermountain territory do not adequately meet competition where the shipment originates near the Atlantic seaboard. This condition, however, affects materials that are stocked by jobbers rather than movement of machinery for immediate use.

"Collections and credits will show a decided improvement in 1923. The ultimate consumer is rapidly getting back to a cash basis and keeping his purchases within his means. The main industries, mining, sugar and agriculture in the Intermountain country suffered from the recent financial depression and from market conditions, but those manufacturers' agents who have weathered the storm can look forward to a return of prosperity in the near future."

H. L. Eicher, of Eicher & Bratt, Seattle, Wash., gives an optimistic view of the outlook in the Pacific Northwest territory. He says, "While the return of prosperity has been heralded for some time and has actually been felt in many lines, I believe that in 1923 it will become a real and tangible thing. Larger payrolls will bring the general public to spend more freely. The result will improve business and will restore credit and collections to their normal status. The manufacturers' agent on the Pacific Coast should prepare his principals for an active demand. The eastern manufacturer who already has an agent here who contemplates such a connection should visit this section and get a closer contact with the people he endeavors to serve or contemplates serving. I believe that this is the most important and best move for the manufacturer and agent. If decision is made to enter this field it should be made wholeheartedly and with a definite plan. Full confidence should be established in the agent selected and accurate knowledge obtained as to local conditions and competition and as to the volume of business that might be expected."

C. D. LaMoree, of Clapp & LaMoree, San Francisco and Los Angeles, also expresses an optimistic view when he says, "Observations of conditions in the East indicate an increasing business for that section, and somewhat higher levels of prices for a large number of the commodities entering into the manufacture of electrical apparatus. The expressions of a number of manufacturers indicate that their 1923 business will be better than 1922. Western requirements will be greater in 1923 and Western business will be better, strictly in accordance with the ability of the West to provide the industry with the necessary materials. Never before were the opportunities for the manufacture of commodities supplied to the electrical trade so great as they are in the West today."

JOBBER, DEALER AND SALES AGENT

Selling Electrical Outlets to the Home Builder

A History of the Events which Led to the Adoption of the "Check" Seal Campaign on the Pacific Coast

By D. E. HARRIS,
Vice-President and General Sales Manager, Pacific States Electric Company

The year 1921 marked a crisis in the electrical industry, as it did in many others. The demand for electrical appliances, wiring and fixtures had visibly declined, and this coupled with sharp breaks in selling prices resulted in an alarming shrinkage in volume of sales.

During this period building operations were at a low ebb, and thousands of men employed in the building trades were out of work. Many electricians were thus affected and quite a few went into the electrical contracting business on their own responsibility, securing their supplies on credit and their contracts solely on the basis of price, this in turn still further demoralized the electrical industry.

Under these circumstances the Pacific States Electric Company found itself faced with the necessity of supporting its volume requirements, and of protecting its future market.

In approaching this problem the officials of the company first took full recognition of the economic factors involved. In 1920 practically all markets were clamoring for goods and the sole problem of the jobber was to get them from the manufacturer and within the reach of the consumer, but in 1921 this condition was reversed and an additional and most important function had devolved upon the jobber, namely, to develop his market.

Primarily, of course, it was apparent that the business of the electrical industry depended in a great measure upon new installations; and that nothing could be done, individually or collectively, to increase them, since this is controlled by basic economic factors which ordinarily cannot be influenced. What then would constitute the basis for co-ordinating the factors upon which the industry must rely?

It was decided to make a comprehensive survey in a specific territory, in order to determine to what extent the rapidly increasing number of casual contractors were affecting the stability of the market. The City of Los Angeles was selected for this survey, and an arbitrary grouping was made of all the electrical contractors operating in that territory. Those representing good workmanship, standard materials and fair prices were considered in one group, and the casual contractors in another. Naturally, in making such a grouping some casual contractors may have been classified under the Qualified Group and vice versa, but averages developed over a long period of time will compensate for this error and give a sound basis for establishing relative values.

Comparative figures were then gathered as to the number of jobs and outlets installed by these two groups of contractors since January, 1920. The figures indicated that in 1920 the Qualified Group had considerably the best of it, both as regards the number of jobs and outlets installed. Their tendency, however, was downward. By this, it is meant that the Qualified Group were at the peak of their performance in the early months of 1920. Starting with May their monthly percentages

The Mountain that came to Mohamet
HERE on the Pacific Coast the mountain has come to Mohamet. True, our lofty ranges stand as immovable as those of the ancient legend, but the power of their falling waters has been converted into electric energy and transported at will by the Power Companies of the West.
Had Mohamet's futile attempt to move the mountain been successful, it's value would have been insignificant compared to this accomplishment. It is an accomplishment combining vision and constructive effort with the courage to assume responsibility for the enormous expense involved.
Nor is there any halt in the effort nor any relaxation of responsibility. New developements and the vigorous maintenance of this vast system requires the daily attention of thousands of men and the highest type of technical skill.
Cheap and abundant power is an established fact and one of the greatest assets of the West, but its value to industry, farms and homes depends largely upon the electrical contractor-dealer who makes the installation, and upon the materials he uses.
To secure an installation which will provide real electrical service go to a "Check" Seal contractor-dealer. These men operate on the basis of good workmanship, standard materials and fair prices. They are qualified to make an installation which conforms to these requirements in every respect.
"Check" Seal contractor-dealers are identified by the "Check" Seal of the Pacific States Electric Company, the largest distributor of electrical merchandise on the Pacific Coast, a mark which also identifies the complete line of standard electrical materials and appliances they sell.
Various items of a complete line of standard electrical materials and appliances certified by the "Check" Seal and sold by qualified electrical contractor-dealers, are described in our new booklet, "The Electrical How for Householders." You will enjoy this booklet, with its many practical suggestions for the convenient and economical use of electricity in your home. It may be obtained free from any electrical contractor or dealer displaying this seal or by writing to one of our offices.
Go to dealers and electrical contractors who display the "Check" Seal
PACIFIC STATES ELECTRIC COMPANY
OAKLAND LOS ANGELES SAN FRANCISCO SEATTLE PORTLAND
Ask for the "Check" Seal

An attempt was made in this advertisement to make the home builder realize the extra value given by the quality contractor-dealer, who displayed the "Check" Seal

steadily declined, so that in December they had dropped below the Casual Group in the total number of jobs installed.

This downward movement became more aggravated in 1921. The Qualified Group steadily declined in the number of jobs and outlets installed, so that by October, 1921, they had dropped to a point where they were installing considerably less than half of the total number of jobs and outlets.

The next phase of the analysis was to determine the tendency in relation to the number of outlets being installed per job. The 1920 general average was 13½ outlets per job—the average for the Qualified Group being 14 for the year, and that of the Casual Group a fraction under 13. In 1921, however, although the Qualified Contractors very closely paralleled their performance of 1920, the average number of outlets per job being installed by the Casual Group took a decided fall, varying between 6.8 and 10.6 outlets per job. The fact that the Casual Group were installing so many more jobs than were the other group, depressed the combined average to between 8.2 and 13.3 in the first ten months of the year. Therefore, taking the low month of October as a basis, each job which was installed averaged 3½ outlets less than the average of the previous year.

Obviously, each electrical outlet installed anywhere in the United States has a definite value to the electrical industry as a whole. It now became necessary to scientifically determine in what proportion the various factors of the industry would benefit by an increase in the number of outlets installed per job.

By this analysis it was found that every additional outlet installed means $20.60 to the industry in a period of five years. This includes revenue to the contractor from installation of wiring devices and fixtures, to the retailer from the sale of appliances, and to the power companies through the sale of current.

While this figure considered individually is not especially significant, when it is multiplied by three or four hundred thousand, which represents the approximate number of jobs being installed each year on the Pacific Coast, the tremendous importance of the individual outlet becomes at once apparent.

The final outcome of this survey was the "Check" Seal Program. While its general purpose was to better the average electrical installation, and to support that part of the industry which was represented by good workmanship, standard materials and fair prices, the specific purpose of the program was to increase the average number of outlets being installed per job. Unquestionably, the rapid decrease in the average number of outlets being installed was due to the evil of awarding contracts solely on the basis of price, and regardless of the completeness of the installation.

Since the value of the individual outlet was known, the direct financial benefit accruing to the various factors of the industry could be definitely determined. Thus, if the general average of the outlets being installed on the Pacific Coast, could in the course of one year be increased by one outlet, it would in the course of five years represent an increased income to the industry of between $6,000,000 and $8,000,000.

Naturally, the only way in which the standards of the electrical installation could be raised either as regards material or a greater number of outlets, was to educate the public to the evil of the low bid system, and the benefits to be derived from an adequate installation.

A plan was therefore devised to establish in the public mind a means by which the electrical consumer could immediately recognize and obtain qualified contracting service and standard materials. Such an effort carried to its logical conclusion would almost certainly result in a definite change of public opinion toward electrical installations, and a decided swing to the Qualified Contractor and to the better type of construction which he represents.

The development of such a plan required as careful an analysis as did that which disclosed the factors which were opposing the progress of the industry.

This analysis produced a number of conclusions that were regarded as basic facts. First, that the American public as a whole considers value of greater importance than price. Second, that while the value and necessity of electricity had been consistently and permanently established, the average householder had no means of determining the relative value of the installation which delivered it or the appliance which it operated. Third, that by showing the public that a difference in the quality of electrical work and appliances existed, and providing a simple means by which this difference could be determined, they could be relied upon to make a favorable choice.

It was believed that an effort based on these conclusions was sound and logical and one which would promote the best interests of the electrical consumer and benefit the entire electrical industry. Upon this hypothesis the orange

Quality Electrical Merchandise
Chosen from the Markets of the World
PACIFIC STATES ELECTRIC COMPANY
Ask for this Seal
The Everyday Meaning of the "Check" Seal
HOTPOINT ELECTRIC IRON—Achieves perfect results with least expenditure of energy. The cantilever handle, found only on the Hotpoint Electric Iron, carries the pressure of the arm and wrist on a direct line to the ironing, eliminating the tense grip and bodily strain required in using old style irons. It is equipped with attached heel stand.
THE NEW HOT POINT WAFFLE IRON—The means to delicious waffles, prepared electrically, without smoke or bother—right at the table. Equipped with double aluminum plates baking entire waffle at one time without "flipping." Heating units are enclosed sheath wire type. Convenient handles, hinges, etc., insure ease of operation and cleaning.
SUPER AUTOMATIC HOTPOINT HUGHES—This range has an automatic time and temperature control, eliminating the housewife's close confinement to the kitchen. Equipped with replaceable heating units, either open coil or sheath wire. The oven has two units for broiling and roasting. The Hotpoint-Hughes is electricity's answer to good and easy cooking.
JUST as the word "Sterling" identifies solid silver, the orange and blue "Check" Seal of the Pacific States Electric Company identifies standard electrical merchandise and reliable electrical contractor-dealers. Contractor-dealers who display the "Check" Seal operate on the basis of good workmanship, standard materials and fair prices.
This means that when they wire a house the work is done right, and that it will stay right. It means that they will provide electrical outlets in sufficient number and at the proper places to insure complete electrical convenience, and that the cost will represent the true value of the installation.
Whenever the "Check" Seal is found on electrical merchandise it means that the article is the best of its kind, such for example as the Hotpoint appliances here displayed.
It means further that these articles have been inspected and certified as standard by the Pacific States Electric Company, the largest distributors of electrical merchandise on the Pacific Coast, and that each one has all of those qualities which the "Check" Seal represents.
Ask for the "Check" Seal
The electrical appliances shown on this page, together with other standard electrical products, certified by the "Check" seal, are described in our new booklet, "The Electrical How for Householders." You will enjoy this booklet, with its many practical suggestions for the convenient and economical use of electricity in your home. It may be obtained free from any electrical contractor or dealer displaying this seal or by writing to one of our offices
PACIFIC STATES ELECTRIC COMPANY
SAN FRANCISCO LOS ANGELES OAKLAND PORTLAND SEATTLE SPOKANE
Go to dealers and Electrical contractors who display the "Check" Seal

Through advertisements of this type the Pacific States Electric Company endeavored to give the "Check" Seal tag character

and blue "Check" Seal now recognized throughout the Pacific Coast as identifying good workmanship, standard materials and fair prices in respect to electrical work and electrical merchandise was established as the keynote of our program.

In September, 1921, the "Check" Seal program was subjected to a practical test in the Los Angeles territory. This territory was selected because of the fact that during the period of depression which then prevailed building activity was greater there than elsewhere. Consequently, it offered a more extensive field of operation for the electrical contractor. And since a large portion of the buildings erected were of the cheaper class of dwellings it also offered an unusual opportunity for price competition. Therefore, if it were found that the "Check" Seal program could make headway against such unfavorable conditions, it seemed logical to assume that a more widespread application would bring even greater success.

Previous to the first appearance of the advertising, the contractor-dealers of the Los Angeles territory were given the details of the program and all those who were willing to operate under the principles represented by the "Check" Seal were invited to participate. It was then arranged that all of those who agreed to operate in accordance with the "Check" Seal standards display a "Check" Seal in their places of business and the "Check" Seal tags on the Pacific States Electric Company's merchandise which they sold. In order, however, that the value of this identifying mark to the public be rigidly maintained, the right to operate under the "Check" Seal was held revocable by the Pacific States Electric Company.

Large space in the leading newspapers was then used to point out to the public the difference between the methods of the responsible, qualified contractor and his casual competitor. It also explained the greater value to be obtained from the employment of good workmanship and standard materials and presented the "Check" Seal as a means of identification for such contractors and such merchandise.

From the beginning, the "Check" Seal program justified the premise upon which it was established. The initial Los Angeles effort was continually expanded and by March, 1922, full-page newspaper advertisements and extensive field work were promoting its principles in all of the larger Pacific Coast cities.

The 1923 "Check" Seal plans are designed to consolidate and further the progress already achieved.

An extended newspaper schedule will employ twenty-seven leading papers throughout the Pacific Coast territory, with a combined circulation of more than 1,123,000. Each paper will forcefully present the "Check" Seal story in ten separate advertisements, giving a combined circulation for the year of more than 11,000,000 separate copies.

In addition to this will be an outdoor program which will tell the "Check" Seal story upon the billboards of thirty coast cities. Many of these boards will be painted and illuminated and the showings will alternate with the newspapers in keeping the "Check" Seal principles constantly before the public.

Uncle Sam as an Aid to the Electric Lamp Dealer

Sacramento Firm Increases Business 500 Per Cent in Two Months as a Result of Direct-by-Mail Campaign

With the aid of a telephone directory, a multigraphing machine and 2,000 letters, the Haag Electric Washer Shop of Sacramento, Calif., was recently able to increase its business in electric lamps 500 per cent in two months.

What makes the report of even more significance is the fact that prior to the sales campaign, business had been good and the company was reaping a profit from the lamp sales. However, F. H. McGinnis, the manager and proprietor of the store, was not satisfied with the sales that he was making and he planned a campaign to increase the demand for the lamps which his store stocked.

Previous to this time Mr. McGinnis had discovered that business picked up when he advertised his stock. However, he had not tried the direct-by-mail advertising scheme in Sacramento. With a realization of the fact that the average purchaser of electric lamps, who has had no particular attention given to him, will go into the first store he happens to encounter, Mr. McGinnis decided to construct a mailing list which would cover the business section of the city.

To secure this mailing list, a new telephone directory was used. Names of business firms were taken directly from this book and the accuracy of this method of securing names is testified to by the fact that out of 2,000 letters sent out only 1.5 per cent were returned to the store, unclaimed.

Just before the direct-by-mail campaign was started the newspapers carried small advertisements of the Haag Electric Washer Shop describing the line of electric lamps that the firm carried. These advertisements were directed at business firms in the city, as the letters were to be sent to this class of prospective customers. No particular effort to produce sales was made in this set of advertisements, as the store expected the letters to really bring in the sales which were desired.

After the mailing list had been taken from the telephone directory, by a young woman who had been employed for the purpose at $18 a week, Mr. McGinnis purchased a multigraphing machine on the installment plan. The initial payment on the machine was $30. The monthly installments were $15. The machine used by the Haag company, and which is a style that could be used by any electrical dealer wishing to duplicate the campaign, was listed at $175.

A competent operator for the multigraphing machine was secured for $18 a week, and after the letter had been prepared, the young woman turned them out at the rate of 400 a day. A good grade of bond paper was used, which had a lithographed heading, upon which the name of the Haag Electric Washer Shop was imprinted.

The letter which was sent out read as follows:

"Whenever an electric lamp 'burns out,' do you have a reliable source of replacement or do you just buy a lamp from a convenient store, regardless of what is offered?

"There is a great difference in electric light bulbs and, without question, the Edison Mazda lamp is unexcelled. Its laboratories are continually striving to bring Edison lamps the nearest to perfection.

"We are representatives in Sacramento for the Edison lamp—we specialize in them. We are going to tell you about new lamps as they appear, so that you will have the opportunity of having the very best at all times.

"The voltage in Sacramento being extra high, all of our lamps are ordered extra high voltages—this makes them last longer—the ordinary lamp is made for 110 to 115 volts and they do not last nearly so long on the high voltage here.

"We want you to ask us questions about lamp troubles—phone and a representative will call to see you.

"Our free delivery serves you quickly and we will appreciate your phoning us the next lamp order, whether one lamp or a hundred. The number is Main 5453.

"Yours very truly,

"HAAG ELECTRIC WASHER SHOP,

"By.....

"N.B.—For those who use quantities, we have a discount schedule which will prove a saving in Mazda lamp purchases."

This letter was enclosed in a good grade of envelope and was accompanied by enclosures from the manufacturer of the lamps. The sealing of the envelopes necessitated sending them by first-class mail but the manager of the firm thought that first-class mail would receive more attention from business firms than would any other class of matter. The extra cost amounted to only $20 on the $2,000 letters sent out.

As a direct result of the 2,000 letters which were sent out, the company estimated that during the 60 days following, lamp sales amounted to $1,000. Thus on an average investment of 3½ cents per letter, the company received a return of 50 cents.

A tabulation of the results obtained from the letters indicated that several of the largest lamp users of the city had not become customers of the store as a result of the first letter. Plans are now under way to send out a "follow-up" letter which will be directed at the large lamp users. These firms which operate electric signs, etc., will be given more personal attention than it was possible to give in the first letter which was directed at all of the business houses of Sacramento.

In reviewing the direct-by-mail campaign, Mr. McGinnis stated that he was entirely satisfied with the returns from the letters in regard to lamp sales. In addition, the publicity which was given to the firm by the letters will undoubtedly react to the benefit of the concern. Purchasers of electrical merchandise who have been led to the store by the sales letters will naturally return there when they wish other kinds of electrical equipment.

Demonstration Shows Utility of Heavy Appliances

Manufacturer, Power Companies and Retailer Cooperate to Show Large Kitchen Owners How to Do It Electrically

The success which has greeted the displays of electrical equipment for the home, has recently led men of the industry to turn their attention to practical demonstrations of the heavy duty electrical appliances. Heretofore, electrical demonstrations have featured the appliances for the home and have been directed at the small user of the electrical devices.

Electrical home exhibits have been common in the West, and in every locality in which these homes have been displayed the electrical business has prospered as a direct result. These installed demonstrating devices have done a great deal to increase the use of electrical appliances in the homes of the West. Actual counts of the number of appliances and convenience outlets in the homes, show that the number has increased approximately 20 per cent in the last two years.

Manufacturers of the heavy duty appliances have realized the value of these educational displays and have proceeded to arrange practical demonstrations of the larger appliances which are suitable for use in hotels, bakeries, restaurants, clubs, hospitals, institutions, and on steamships. The men interested in the sale of these devices decided that the market was ready for the appliances and that to increase the present demand, it was necessary to demonstrate the practicability of the electrical equipment.

San Francisco was the location chosen for the first display of heavy duty electrical equipment suitable for hotel and restaurant use. The manufacturer decided to cooperate with the retailer and power companies, and arranged a display of the most up-to-date equipment in the retailer's store.

In locating the display the retailer's store was chosen because it was the most centrally located and also because the men who had been invited to visit the exhibition were familiar with the store as it handles a great amount of equipment used by the large kitchen operators. The fact that the display rooms given over to the exhibition were not wired for the installation of the heavy duty appliances did not offer any serious objection to the plan. Direct wires from the distributing lines of the two power companies interested in the display were run into the building and were connected to the equipment on display. Service men of the central station companies completed the installation of the equipment furnished by the manufacturer. The ease with which the devices were connected with the power lines proved to be a point which could be pointed out to the guests who had locations not already wired for electrical equipment.

Previous to the date of the display invitations were sent out to managers of hotels, bakeries, restaurants, cafes, hospitals, clubs, and other men who would be interested in the display. All of the larger establishments of central and northern California were included in the invitation lists. In addition to this, a general invitation was presented to the public through the newspapers. No display advertising was used as it was considered unnecessary.

Attendance proved to be all that the men in charge of the exhibit had hoped for and they were particularly gratified with the results obtained from the invitations. Hundreds of operators and executives of establishments conducting large kitchens were present during the days of the exhibition.

The display opened on Nov. 20 and lasted for two weeks. During the time, a competent pastry cook and an expert chef were present to demonstrate to the visitors the advantages of the electrical equipment. Daily, meats were roasted in the large electric ovens, and whole meals were prepared before the guests. The leading features which interested the visitors were the accuracy of control which could be secured with the electrical equipment, and the speed of the range tops and ovens.

Much favorable comment was heard from the guests concerning the ovens, in which the shrinkage of meats was greatly lessened. The elimination of smoke from fuel combustion, the fuel economies, through simple regulation, and the rugged construction of the devices were also demonstrated in a convincing manner.

Throughout the two weeks, hotel type ranges and cooking tops, griddles, toasters, doughnut stoves, waffle bakers, baking ovens, steam tables, water and air heaters, plate warmers, broilers and many other practical devices were connected and operated exactly as they would be in large kitchens. As the men who visited the display were well acquainted with the other types of heating for the cooking devices, it was a fairly simple matter to demonstrate the advantages of the electric equipment. Men who were well versed in the electrical devices were present at all times to answer any questions that the visit-

Part of the electric oven equipment displayed at the heavy appliance exhibition. Note the placards describing the appliances.

ing executives and operators cared to ask.

These men who acted as guides, were aided by signs which were placed on the equipment. Each device was named and the type, wattage, and price were noted on the small placards. It was found that by placing this information in plain sight, the visitors were better able to determine for themselves, in what type and capacity of equipment they were particularly interested. The fact that visitors were better able to remember figures which they saw, than those which they heard, was also demonstrated here.

Previous to the demonstration of heavy duty waffle bakers, cafe and restaurant owners had been experiencing considerable trouble, during the rush hour at noon, keeping up with the demand for waffles. A considerable number of irons was needed to handle the orders when the demand was at its height as the irons heated by gas or oil had heating surfaces on one side only, necessitating the turning of the waffle. This feature cut down the number of patrons that the establishment could handle with a moderate supply of equipment.

During the exhibit, a heavy duty waffle baker was displayed which promises to remove the difficulties experienced by the restaurant and cafe men who serve waffles to their guests. A battery of three irons was shown on which perfectly baked waffles were turned out at the rate of 120 per hour. The demonstration was so successful that many restaurants and cafes of San Francisco, Fresno and other northern California cities, are now being equipped with the electric waffle irons, which bake both sides of the waffle at once. Another feature which appealed to the discriminating men, was the fact that the irons could be had with aluminum cooking surfaces, which need no greasing. When no grease is used there is no offensive smoke given off by the iron while the waffle is being baked.

The hotel type cooking top and the range surprised the visitors by the speed with which they cooked the food

According to reports from the men in charge of the exhibition it was entirely satisfactory. A great deal of goodwill was secured for the electrical devices and the visitors who attended were given information which they could not have received in any other way. Personal contact was secured between the prospective purchasers and the men interested in the sale of the appliances which will lead to greater business in the future. The practicability of the electrical equipment was shown to the men so clearly that the complete electrification of many of the kitchens and cafes of northern California may be expected in a short time, according to one of the men interested in the display.

The exhibit was conducted on the fifth floor of the Nathan-Dohrmann Building in San Francisco. Direction of the display was handled jointly by the Nathan-Dohrmann Company, the retailer; the Pacific Gas & Electric Company, the Great Western Power Company, central station companies; and the Edison Electrical Appliance Company, the manufacturer.

The electric waffle irons, griddles, toasters, doughnut stoves, and water heaters, proved to be highly interesting to operators of restaurants and cafes

INDUSTRIAL NEWS

Denver Will Be Served by Large Steam-electric Plant

Construction of the largest steam-electric central station generating unit between the Missouri River and the Pacific Coast will be started in the near future by the Denver Gas & Electric Light Company and the Western Light & Power Company of Denver, Colo. The plant which will be constructed four miles south of Boulder, Colo., will also be the largest steam-electric plant ever erected on an artificial body of water.

The general plans call for sufficient units to develop 120,000 hp. with a possible ultimate development of 250,000 hp. The installation to be made at present will entail an expenditure of approximately $4,000,000. The entire development will cost about $12,000,000.

The plant will supply the cities of Denver, Boulder, Fort Collins, Greeley and numerous smaller towns in northwestern Colorado. It is the purpose of the two companies, to be prepared for the electrification of the Moffat Tunnel project.

Boulder Lake, upon which the plant will be erected, now has a storage capacity of 128 acres and impounds approximately 78,000,000 cu. ft. of water. A dam will be erected to increase this capacity to 280,000,000 cu. ft. All coal used by the plant will be stored under water in the lake. A 50,000-ton supply of coal will be stored in this way.

It is the plan of the construction engineers to install steam generating equipment which will be able to use the powdered low grade coal from the mines within a radius of twenty miles of the plant. This will cut down the operating expenses of the plant and will also provide a good market for the low grade coal which has hitherto been of very little use.

New Line Extension Rules Made in State of Washington

A recent order issued by the Department of Public Works at Olympia, Wash., prescribed uniform regulations governing the construction of all line extensions by privately owned electric utilities in the state. Following an objection by the City of Spokane to the Washington Water Power Company charging consumers for extensions, the ruling was issued, conforming with the city's and company's ideas on the matter. The new rules are said by Hance Cleland, supervisor of utilities, to be the basis of two years' study by engineers and officials of the department. Conferences were held last summer with electric utility representatives, and tentative regulations were discussed at that time.

Under the new policy adopted, the company will be required to furnish each customer on a proposed line extension, one 35-ft. pole, one two-wire span of 150 ft., one two-wire service drop of 50 ft., one 5-ampere meter, and necessary accessories for that amount of construction. If the extension is built on another plan, the company will furnish the cash equivalent of this part of the construction, or $35.

Another important provision is that, should the actual cost of construction of an extension be less than the estimates made by the company, the applicants will receive a refund, pro rated on the amount each paid.

"These rules may save rate increases in the future, where utilities construct electric line extensions on an unwise, injurious and unprofitable basis," said Mr. Cleland. Such companies in the future will be required to collect a larger amount from applicants for extensions. On the other hand, where utilities have required an excessive payment from applicants for extensions, the charges to these new customers will be reduced. Mr. Cleland estimated that the new rules will require one large electric company to charge prospective customers in the future approximately 75 per cent of the charge made, heretofore under the policy of the company. He said the regulations will also require detailed cost estimates and definite accounting on line extensions.

The companies may depart from the regulations only on the ground that they are giving a greater service to customers than required. A copy of the rules is being sent to all state commissions, as this state is one of the first to attempt regulation of this kind.

Rate Regulations Are Changed by Utah Municipal Plant

Nephi City, Utah, which operates a municipal power plant, has been granted permission by the public utilities commission of Utah to make two amendments to its rules affecting electric service. The first requires a tenant to deposit a sum equal to two months' charge for what service he would require, as a guarantee of the payment of the charges to accrue. This advance does not relieve the person from paying the monthly charge to become due except where he fails to pay the charges at the end of the month, when the deposit might be applied, the service discontinued, and the balance returned to the patron.

The second amendment makes the owner of the property liable for the service charges, unless he gives written notice to the city lineman of his intention to lease or rent his premises, and asks that his liability cease.

Contract Let for High Voltage Insulator Factory

Contract for the first high voltage insulator factory to be erected on the Pacific Coast, has recently been let by the Westinghouse High Voltage Insulator Company to the Ralph McLeran Company of San Francisco. The new factory will be erected at Emeryville, Calif. The Westinghouse High Voltage Insulator Company is a subsidiary of the Westinghouse Electric & Manufacturing Company and has its head office at Derry, Pa.

Although the Pacific Coast produces about 80 per cent of the hydroelectric power developed in the United States, no attempt has been made to manufacture high voltage insulators here, before. The new company will use California oil in its kilns and will also use California clay.

The main building, at Emeryville, will contain four kilns for firing the porcelain ware, with possible extensions to include twelve kilns. The product will be shipped to all points on the Pacific Coast and will serve territory as far east as Salt Lake City, Utah.

Ray P. Jackson will be sent by the Westinghouse Electric & Manufacturing Company, to take over the managership of the new plant when completed. Marsden H. Hunt will accompany Mr. Jackson, and will act as plant superintendent.

San Francisco Accepts Bids for Transmission Line Wire

Contract for 177 miles of copper wire to be used in the City of San Francisco's transmission line from the Moccasin Creek power house to Newark substation, was recently let to the Anaconda Copper Mining Company, through the San Francisco jobber, the Pacific States Electric Company.

The contract calls for a 345,000-cir. mil. copper cable with a hemp core, the diameter being ¾ in. The 177 miles of cable will weigh 1,700,000 lb. and will cost the city approximately $317,000.

A bid for the aluminum wire for use in the long spans of the transmission line was made by the Aluminum Company of America. The bid for 1,800,000 lb. of steel reinforced aluminum cable was 21½ cents a pound.

The Moccasin Creek power house is a part of the Hetch Hetchy project now under construction. The entire transmission system will cost in the neighborhood of $5,000,000, according to estimates of the San Francisco city engineer's office. Construction will start within a few months. Bids for the erection of the transmission system have not been called for yet.

Cowlitz River Bridge Crashes Under Heavy Load

Old Wooden Structure in Washington Collapses Throwing Many Automobiles and Pedestrians into River

For reasons not fully determined by engineers, the Cowlitz River bridge, spanning the Cowlitz River in the town of Kelso, southwestern Washington, collapsed recently bringing death to not less than 30 persons.

The bridge was a timber suspension structure with timber stiffening trusses, on pier pilings, featuring a bascule span at one tower support furnishing a 60-ft. opening. This span was operated by cable lift and counterweights.

The bridge was built in 1905 by the Cowlitz Bridge Company, of Kelso, for Cowlitz County. In 1915, it was repaired with replacements of timber portions which had deteriorated.

At the present time, work is progressing rapidly on a 500-ft. steel bridge having a Waddell vertical lift for the channel span. Had it not been for delay in delivering steel for the lift portion, the new bridge would have, undoubtedly, been ready for traffic at the time of the disaster. The balance of the structure, consisting of three approach spans, has been completed for some weeks.

The new bridge is being built by the Pacific Bridge Company, of Portland, and the Gerrick & Gerrick Company, of Seattle. The former named firm has the general contract and the latter the steel erection award.

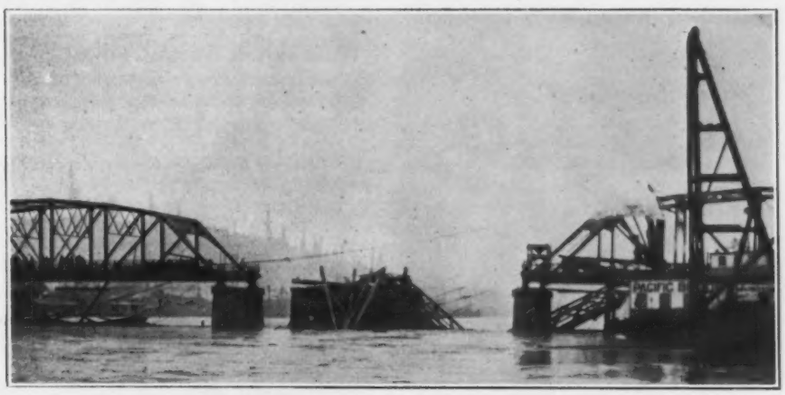
Explaining the overload on the collapsed structure at the time of the accident, it is stated the bascule had been raised for some time to permit river traffic to proceed. During this period, numerous cars lined the roadway leading to the approaches on either side and, when the bascule was lowered, moved on, despite the warning sign, placed by the county, insisting that cars space themselves not less than 50 ft. apart. About 15 cars, the exact number is not known, were lost.

Several engineers, authorities on bridge construction, unofficially state the collapse was probably caused by the breaking of a main suspension cable, near the tower, due to overload or deterioration, or both. Or again, that the stripping of an anchorage turnbuckle may have been the cause.

Permission Given for Erection of Two Power Houses

The California Railroad Commission has given the San Gorgonia Power Company permission to build two power houses in the San Bernardino Mountains near Banning, Calif. The Southern Sierras Power Company will take all of the electrical energy generated by the San Gorgonia company.

The water for the two hydroelectric plants will be diverted from irrigation ditches and after passing through the power houses will be returned to the ditches so that it may be used for irrigation purposes. The power generated will be sent over the Southern Sierras Power Company lines to the Coachella and Imperial Valleys.



A portion of the collapsed bridge across the Cowlitz River, may be seen between the sections of the new steel structure under construction

At the last session of the British Columbia legislature, which ended just before Christmas, an act was passed to provide for the inspection and regulation of premises and equipment for the generation, transmission, supply, or use of electric energy. It is understood that the Provincial Government purposes to appoint several inspectors, to look after the electrical equipment in the different parts of the Province.

The Port of Portland is negotiating with the Shipping Board for the purchase of two Diesel engines to be used in equipping a new river dredge. The plan is to make it a Diesel-electric one of about 2,000-hp. capacity with cedar hull.

Application for a permit to appropriate the water of the Nasel River in Pacific County for the purpose of light and power for the cities of South Bend, Ilwaco, Chinook, etc., has been made by the Nettleton Power Company of South Bend, Wash. The purpose is to develop 10,000 hp. and to supply the cities with light and power. A dam 125 ft. long and 50 ft. in height will be constructed. The cost will be about $250,000.

The new steam-electric plant which is being built in Craig, Colo., by the Hendrie & Bolthoff Electrical Supply Company of Denver, is rapidly nearing completion. The plant when completed will supply electric power for the Colorado town.

Service Resumed by California Company After Fire

Approximately seven and one-half days after the fire, which caused damage to the amount of $50,000 to the Eagle Rock switching station of the Southern California Edison Company, all impediments to the distribution of power were removed and the system was on a physically normal basis. Men of the Edison company's engineering and repair departments worked day and night to put the system into service again.

While the Eagle Rock station was incapacitated the company secured power from its steam plants at Long Beach and Redondo, Calif., and from interconnections with the San Diego Consolidated Gas & Electric Company and the Southern Sierras Power Company.

The Eagle Rock station is the terminus of the Big Creek transmission line and the station receives a total of 175,000 hp. from this and other sources. Power is received at 150,000 volts and is stepped down for distribution purposes. When the explosion of the lightning arrester occurred, a short circuit was established between the high-voltage wiring of the station and the fire resulted.

In bringing the Big Creek power back on the line, the arrangement of the transformers there was taken advantage of by the company's engineers. The installation at the first power house there is such that the transmission voltage may be stepped-down to 60,000 volts. This was done at the power plant and the power was sent to Los Angeles at 60,000 volts. Thus the Eagle Rock station was cut out of the circuit and the Big Creek plant was tied into the 60,000-volt distribution circuit directly.

Utah City Plans Development of Hydroelectric Power

Parowan City, Utah, plans to construct a municipal power plant to furnish electric energy to citizens and residents in the vicinity. An application has been filed with the state engineer for permission to divert 24 sec.-ft. of water from Center Creek in Iron County for developing a total of 600 hp.

It is proposed under the application to divert the water at a point about about three and one-half miles southeast of Parowan and from there to convey the water by means of an iron or wooden pipe about 28 in. in diameter a distance of 9,650 ft. northwest to the power house site at the base of the Parowan mountain range where it will be used under a head of 300 ft. to operate a single Pelton water wheel of 6-ft. diameter.

City of Pasadena Plans to Erect Step-up Substation

The City of Pasadena has brought condemnation proceedings against the owners of property adjoining its plant on Glenarm Street in Pasadena, Calif. The city plans to erect cooling towers, and a step-up substation on the property.

The manager of the plant plans to increase the generating capacity of the steam driven units. It is planned to install four new boilers in the plant during the coming summer months, others to be added as needed.

Events in Washington of Interest to Western Men

A Survey of Recent Developments in the Nation's Capital by Paul Wooton, Special Correspondent of the Journal of Electricity and Western Industry

There is every reason to believe that each one of the seven states that are parties to the Colorado River compact will ratify that unique peace treaty at the session of their legislatures which are now in session. At the same time it is recognized that it lies within the power of any one of the seven states to delay the ratification of this compact and leave the road open for litigation with the resultant blockade for a generation at least of this great national asset. Ratification of the compact means:

(1) Elimination of litigation thus removing blockade on development of 242,000 square miles, a territory larger than the Republic of France.

(2) Orderly development through irrigation and cultivation of 4,000,000 acres of land, now desert.

(3) Utilization, as economic conditions warrant, of waste waters in generation of over 6,000,000 hp. with resultant saving of diminishing fuel resources.

(4) Construction of dams urgently needed for control of floods annually threatening Imperial and Palo Verde Valleys in California and Yuma project in Arizona,—rich communities assessed at over $100,000,000 where 75,000 to 100,000 Americans gain their living.

(5) New homes for 3,000,000 American citizens, including ex-service men and women.

(6) New communities which will furnish increased markets for the whole country.

(7) Increased wealth to meet our tax burden.

The compact divides the river system into an upper and lower basin and on natural boundaries and economic lines,—i.e., two basins are separated by a thousand miles of canyon and time in which two basins would normally develop, and crops are different. Allocates in perpetuity 16,000,000 acre-feet or 80 per cent of the total natural flow of 20,000,000 acre-feet of the river, more than sufficient to water all lands now being irrigated and all lands which can be economically developed for forty years to come; provides for appointment of a new commission at the end of forty years and leaves to that commission 4,000,000 acre-feet, or 20 per cent of the total natural flow for second apportionment among states; gives agricultural precedence over power; as the river is practically unnavigable, the compact makes navigation subservient to other uses; and leaves all question of Mexican rights to water up to the Federal State Department, the only organ of the American people having any right to deal therewith.

This compact, which adequately protects the interests of all the states and of the Federal Government, is a historic step in interstate relations as it is the first time that more than two states have availed themselves of the Constitutional privilege of settling their differences by negotiation and compact. It will serve as a precedent in substitution of peaceful medium of negotiation, for that of costly litigation with resultant delays in development. It has settled, after eleven months of intensive and exhaustive study, important questions of conflict covering a whole river system and affecting seven states and the Federal Government, whereas similar disputes between two states relative to small tributaries have taken years when submitted for settlement to the courts.

Flood Control Scheme Presented by Utah State Engineer

Flood control through regulation of the storage capacity in reservoirs on the Sevier River is being proposed by R. E. Caldwell, Utah state engineer. The utilization of the reservoirs in storing spring waters is advocated to prevent the damage done annually through floods along the river system.

The engineer has compiled tables showing that in the past nine years ending with 1921 the annual flow of water into the Piute reservoir was sufficient to fill that reservoir during the months of January, February, March and April in seven of the nine years. The stream measurement data on the stream shows conclusively that the larger flood season comes in May and June. It appears advisable to completely empty the reservoir in January of each year and to gradually build up the storage from the flood waters, thus preventing the river from overflowing its banks at this period.

Mr. Caldwell's plan contemplates the reservoirs on the lower Sevier building up their storage during the first few months of the year and then having the upper reservoirs utilize the waters during the later season.

Erection of Substation Starts Construction Program

The erection of the Laguna-Bell terminal station is to be the first step in the $375,000,000 construction program of the Southern California Edison Company. The program extends over a period of ten years.

According to George C. Ward, vice-president in charge of construction, the entire construction project, when completed, will develop in the neighborhood of 1,250,000 hp. The power will be distributed to most of the counties in southern California.

The new substation will be located in the Vernon district of Los Angeles and will serve as a distributing center for power brought from the Big Creek developments. The capacity of the plant will be 160,000 hp. It will receive power over a new transmission line which is an extension of the Big Creek transmission line. The connection with the line will be made by a new trunk line, thirty miles in length which will connect with the main trunk line at a switching station back of the Eagle Rock station.

The new substation will be constructed in the near future and will cost approximately $2,000,000. The station will be of the outdoor type and will have the most modern installation possible.

Many Meetings Held to Discuss "Check" Seal Program

In conjunction with the releasing of its 1923 "Check" Seal advertising program, the Pacific States Electric Company has been holding a series of meetings throughout California, Washington and Oregon. The meetings began with one held in the home office of the Pacific States Electric Company in San Francisco, on the afternoon of Jan. 5 and followed by one in Oakland that evening. Other meetings were held in Los Angeles, Stockton, Modesto, and Merced on Jan. 9; in Fresno, on Jan 10; in San Diego and Bakersfield, on Jan. 11; in Porterville and Visalia, on Jan. 12; and San Jose and Sacramento on Jan. 18 and 19. One group of men in charge of the meetings then went to the Pacific Northwest and presented the sales meetings at Portland, on Jan. 19; Seattle, Jan. 23; Tacoma, Jan. 24; Bellingham, Jan 25 and at Everett, on Jan. 26. Two distinct parties conducted the sales meetings thus enabling them to cover territory faster.

The meetings have been well attended by leading electrical contractors, electrical retailers, architects, building contractors, and officials and representatives of the various power companies. They have been given over to a discussion of the different aspects of the "Check" Seal program. The subject matter dealt with is fully covered in an article by D. E. Harris, vice-president and general sales manager of the Pacific States Electric Company, which is printed elsewhere in this edition. Similar meetings will be held in the various towns throughout the Pacific Coast until all of the towns covered by the "Check" Seal advertising program for 1923 have been reached.

Washington Water Power Co. Orders New Equipment

The Washington Water Power Company of Spokane, Wash., has awarded contracts for a new turbine water wheel and General Electric generator having a capacity of 22,500 hp., to be installed at the Long Lake power plant. This will bring the Long Lake plant to its capacity of 90,000 hp., on which scale it was planned when the original construction began in 1911.

The new machines, penstocks, foundation and labor will cost several hundred thousand dollars, the amount not yet determined. Shipment on the new equipment contracts is to be made next summer that the new unit may be ready for the winter load. The machines will be shipped by the Great Northern Railroad to Springdale, Wash., and thence over a logging road to Ford, Wash., from there the machinery will be transported by trucks to Long Lake.

Extensive enlargements of the facilities of the Salt Lake & Utah Railroad Company at the site of the new steel mills between Provo and Springville, Utah, will be made in the very near future. New tracks and sidings will be installed at the steel site to properly take care of increased freight and passenger traffic, which necessarily will come with the beginning of construction work on the blast furnace and coke ovens of the Columbia Steel Corporation. It is expected construction of the steel mill will begin about March 1.

Transmission Line to Project on Kings River Started

Construction on the Kings River project of the San Joaquin Light & Power Corporation started with the clearing of the right-of-way for the transmission line from Piedra, Calif., to the site of the proposed Balch power house at the junction of the north and west forks of the stream. The line under construction will be 22 miles long and will cost in the neighborhood of $170,000.

Approximately 100 steel towers will be built on the line. Aluminum wire will be used. The line when completed will carry power to the site of the power house to be used to run machinery needed in the erection of the plant, and will later connect the plant with the rest of the San Joaquin system.

The transmission line as now being constructed is for 110,000-volt operation. In the line some of the largest spans in the history of steel tower line building will be made. In one place where the line crosses the river there will be a span of 4,100 ft. A reinforced aluminum cable with a steel core will be used for this span and each circuit will be carried on a separate tower. The Pacific Coast Steel Company is making the towers.

Utah Engineers Will Establish Permanent Headquarters

Establishment of permanent headquarters in some centrally located downtown building, in Salt Lake City, Utah, employment of a full-time paid secretary, installation and maintenance of an engineering library and closer affiliation with civic affairs from an engineering standpoint were among the plans discussed at length and approved at a meeting held recently by the Utah branch of the American Association of Engineers.

The meeting was well attended, among those present being H. T. Plumb, Dr. Joseph F. Merrill and R. K. Brown as representatives of the Engineering council, which includes in its membership all branches of the engineering profession.

"It was the consensus of opinion," said C. J. Ullrich, one of the active members of the association, "that the engineers can, in a big way, do much public service outside of their personal professional service when specifically employed. In addition to the establishmen of headquarters, maintaining an engineering library and employing a paid secretary, we expect to open an engineering employment bureau and in numerous other ways render the engineering organizations of the state more coherent and effective."

Increase in Electric Rates Is Granted Municipal Plant

The Fairview municipal power plant, situated at Fairview, Utah, has been authorized by the public utilities commission of Utah to increase its rates for electrical service.

The increases consist of one cent per kw-hr. for residence lighting service, and 10 per cent to the flat rate service. A 10 per cent discount is allowed for prompt payment, whereas no discount has been allowed heretofore.

The case came before the commission on the application of the mayor of Fairview, and was protested by the patrons of the company.

The officials of the town represented that no depreciation reserve had been set aside to take care of replacements. The utilities commission expressed the view that the plant would now be in much better condition except for this failure to establish a depreciation account to keep the plant in condition to render adequate service.

The commission places the depreciable physical property value of the plant at $25,000 and on this value sets $1,979 as the minimum annual amount to be set up as depreciation. Based on the 1921 business the gross revenues are estimated at $4,440, and gross expenses at $5,100.66, including the amount specified for depreciation. It is estimated, however, that $300 will be saved through prompt payment of bills, and the resulting deficit under the new rates will be reduced to $360.57 a year under the commission's findings.

Seventy-Five Thousandth Meter Installed in Denver

Meter No. 75,000 was recently tested and installed by the Denver Gas & Electric Light Company. C. L. Stannard, vice-president and general manager of the company, completed the tests on the meter and had it installed in his new home.

The first meter installed by the Denver company was put in under the direction of the late William J. Barker. Meter No. 1 was located in the "Arcade," a famous gambling hall and cafe of the early days.

In the forty years that have elapsed since the first meter was tested, 75,000 meters have been handled by the Denver Gas & Electric Light Company.

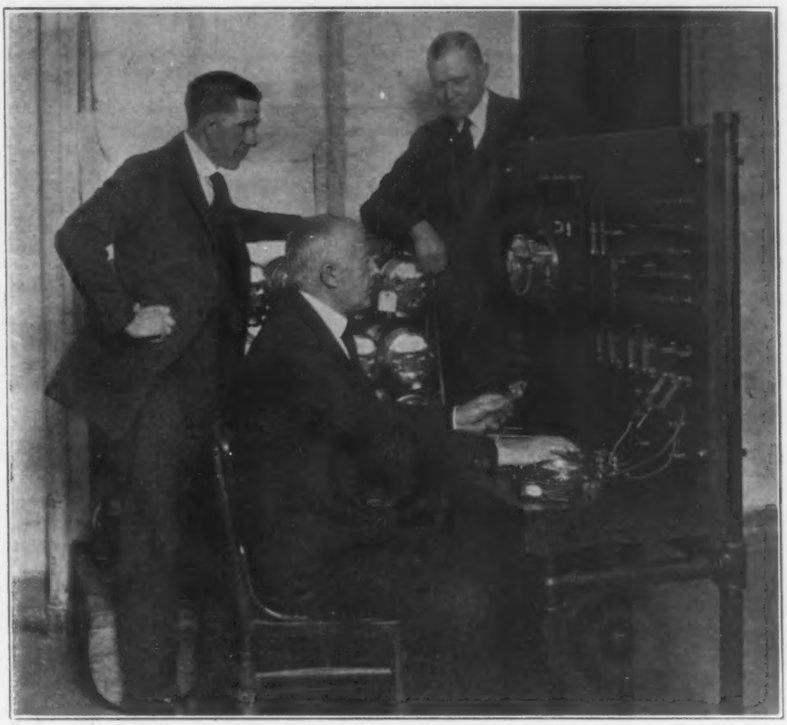
Ford Plant in Los Angeles Will Be Largest in West

Announcement has recently been made that the largest Ford assembly plant west of Chicago will be situated in Los Angeles within a short time. B. L. Graves, western district supervisor of the company, has announced that plans have been drawn and that bids will soon be called for a two-story addition to the present assembly plant in the southern California city.

The extension will add 90,024 sq. ft. of floor space to the present plant. The dimensions of the addition are to be 132 ft. x 341 ft. This will give the plant a frontage of 340 ft. on the railroad and will permit the unloading of thirteen railroad cars at one time. When the plant is completed 350 more men will be needed to supplement the present crew of 650. Between 240 and 300 cars, will be the daily output of the assembly plant when the addition is completed.

The Northwestern Electric Company of Portland, Ore., recently placed an order with the Westinghouse Company for a 7,500-kw., 80 per cent power factor, turbo-generator to be used at the Lincoln steam plant, thereby doubling its generating capacity. Work is already under way at the plant, making the necessary changes and additions. No additional boilers will be needed. A total expenditure of half a million dollars will be made.

Contract for the new extensions of the Electric Supply Company of Canton, China, has been awarded to the firm of Anderson, Myer & Company, Ltd., of New York. The contract figure is approximately $700,000.



C. N. Stannard, vice-president and general manager of the Denver Gas & Electric Light Company, testing meter No. 75,000. H. P. Tewksbury, superintendent of central station meter department, standing at left and V. L. Board, general superintendent of the company, at Mr. Stannard's right.

San Joaquin Company to Enlarge Crane Valley Power House

The enlarging of Power House No. 3 of the Crane Valley system of the San Joaquin Light & Power Corporation, and the subsequent widening and relining of the conduit carrying water to the Crane Valley power houses, at a cost of $219,000, is to begin between Feb. 20 and March 1, according to L. J. Moore, executive engineer. The work will be under the supervision of construction engineer H. K. Fox, with C. P. Rhine in charge of engineering and A. J. Black in charge of construction.

The conduit system, which supplies the Crane Valley power houses, consists of a series of canals, tunnels and flume trestles, covering a distance of 4.22 miles. Storage water from the Crane Valley reservoir enters the conduit system and is delivered into the regulating reservoir of No. 3 power house. Water stored in the Crane Valley reservoir passes into this conduit system and through the turbines of the entire Crane Valley chain of power plants before it is turned into the main channel of the San Joaquin River. It is again diverted for use in the Kerckhoff power house and when it is finally released, has operated the turbines for six plants.

The section of No. 3 conduit to be enlarged begins at the outlet tunnel under the Crane Valley dam, extending 4 miles, to the forebay reservoir at plant No. 3 It contains about one mile of small tunnels, the balance of the conduit being cement-lined earth ditch and steel flume supported on trestles. The entire ditch is not only to be relined with cement, but widened, increasing present capacity of 105 sec.-ft. to 170 sec.-ft.

The plant has a present generating capacity of 2000 hp. from two Allis-Chalmers units. It is connected to the transmission system through three, 350-kw. and three 667-kw. transformers. With the addition of the new 4,000-hp. S. Morgan Smith turbines and the General Electric generator, which will be removed from the old Kern Canyon power house, the generating capacity of the plant will be increased to 6,000 hp.

More floor space will be required and an 18 x 36-ft. addition, constructed of concrete with a corrugated roof, supported on steel girders, in which the new equipment will be installed, will be built onto the old power house. This addition will be built out over part of the reserve No. 3 reservoir. Some of the new equipment has already arrived and will be put in place as rapidly as the work on the power house will permit.

About one-half mile of trestle supporting the steel flume will be replaced and sections of the old conduit relined. These flumes are somewhat novel in construction, being of ⅛-in. riveted sheet steel, supported on timber cradles and bolsters, which in turn are carried by standard four-pile trestle bents. Expansion and contraction will be provided for by an unriveted slip joint.

Preliminary Permit Granted to Southern Edison Company

A prelimianry permit for a power development of the San Joaquin River, and on the lands of the United States within the Sierra National Forest in Fresno and Madera Counties, California, has recently been granted to the Southern California Edison Company by the Federal Power Commission of Washington, D. C.

The project involves the construction of a system of reservoirs, conduits and power houses on the middle fork, lower part of the south fork, Jackass and Chiquito Creeks, and about five miles on the main San Joaquin River. When developed it will form a part of the power system on Big Creek and the San Joaquin River. It is estimated that an installed capacity of 250,000 hp. could be placed economically.

San Francisco to Have Combined Radio and Electrical Show

To develop radio business and electrical business in general, the American Radio Exposition Company, of New York, N. Y., is to conduct a combined radio and electrical show in the San Francisco Auditorium, Apr. 3-8, inclusive. A similar exposition was conducted in New York recently and the success of the venture prompted the company to prepare for one on the Pacific Coast.

The exposition has been endorsed by the Pacific Radio Trade Association, the San Francisco Electrical Development League, the California Association of Contractor-Dealers, and the San Francisco Contractor-Dealers' Association. Space at the show will be open to all branches of the electrical industry.

Requests for Power Permits Are Indefinitely Suspended

The applications of the City of Los Angeles and the San Joaquin Light & Power Corporation, for power sites in the mountains of Fresno County, California, have been placed on the indefinitely suspended file by the Federal Power Commission at Washington, D. C. Both applications were for projects on the Kings River.

The action of the commission follows action taken last May when a hearing was held before the division engineer of the Federal Power Commission and the engineer of the division of water rights of the California Department of Engineering. At that time Los Angeles officials admitted that the city was not ready at the time to follow up the filings on the Kings River and would not be for some time to come.

Both projects would come within the territory of the proposed Sequoia Roosevelt National Park, which is being urged by Representative Henry Barbour. Efforts are being made to get the Barbour Bill before Congress at the present session. The American Civic Association has gone on record as favoring the bill.

The Idaho Power Company has applied to the Federal Power Commission at Washington, D. C., for a license to erect a 132,000-volt transmission line from Caldwell, Idaho, to Ontario, Ore.

The Lewis River Light & Power Company of Woodland, Wash., has been acquired by the North Coast Power Company of Portland, Ore. The Woodland plant has received power from the North Coast Power Company for several years.

Books and Bulletins

DIRECT CURRENT MACHINERY

By HAROLD PENDER, PH.D., Director, Department of Electrical Engineering, University of Pennsylvania. 6 x 9 in. 314 pages. 146 figures. $3. John Wiley & Sons, Inc., New York.

At a time when the design and application of alternating current machinery is receiving so much consideration, it is gratifying to see a new text-book which covers the subject of the earlier application of electricity. Dr. Pender's textbook on the theory and performance of direct current machinery is a very good treatment of this class of equipment without any attempt at a treatise on design.

In the first chapter the author has assumed that the student has a knowledge of the elementary principles of electricity and magnetism, but as a ready means of reference a summary of these principles has been included. This has an advantage in that it combines such material in one chapter in the text and gives the student a rapid review of the basic laws. An objection might be raised to this treatment as compared with the method of presenting the principles when they are applied throughout the text, but any method which assists in the thorough mastery of the fundamentals before beginning the detailed study of the various machines is greatly to be desired.

The greater part of the book is devoted to the performance and application of direct current generators and motors and the outstanding feature is the excellent treatment of commutation and armature reaction. Concerning the chapter on commutation the author states that an "attempt has been made to treat this subject in an understandable, and yet rigorous manner. The nature of the effects produced by the various factors involved, and the conditions which must be established in order to avoid sparking are first shown by considering a simple ideal case. The variation in practice from the assumed ideal conditions, and the practical method of securing satisfactory commutation, are discussed in detail."

In the chapter covering the voltage regulation of generators and the operating characteristics of motors, the author has developed an original and ingenious graphical method of showing the performance of such machines.

The subject of commercial testing of direct current machinery is well treated in one of the longer chapters and a good selection of problems at the end of each chapter, with the excellent illustrations throughout the book, should assist materially in its usefulness as a text in engineering schools and as a reference work for those actively engaged in engineering.

E. R. S.

To provide uninterrupted service to the downtown district of Long Beach, Calif., the Southern California Edison Company is to install a new $200,000 substation in the district. The substation will be situated in one of the alleys in the business section of the city.

Meetings

Progress of Industry Celebrated by Los Angeles Club

In commemoration of the thirtieth anniversary of the operation of the Redlands Light & Power Company's Mill Creek Station, the first hydroelectric polyphase station in the world for long distance transmission, the Electric Club of Los Angeles held a meeting on Jan. 15, on "Thirty Years of Progress." The speakers on that day were R. H. Ballard, vice-president and general manager, Southern California Edison Company; H. B. Woodill, president Woodill & Hulse Electric Company of Los Angeles, and D. F. McGarry, former president of Los Angeles Realty Board. A. L. Spring, field representative of the California Electrical Cooperative Campaign, presided as chairman.

Mr. Ballard told of the expansion of the hydroelectric development in southern California and pointed out how this section had grown from the little Mill Creek Station plant to the large number of hydroelectric plants at present in operation. He also told of some of the men who were connected with the industry in bygone days and of the obstacles that had been overcome. Mr. Ballard stated that southern California had been a leader in the hydroelectric field in the installation of long distance transmission lines of high voltages. Comparing the progress of the past thirty years in the section in the electrical field with what may be expected in the next thirty years was also discussed by Mr. Ballard.

Mr. Woodill, who was one of the linemen of the Redlands Light & Power Company thirty years ago, told of the vicissitudes of the electrical business in those days and of the installation of the Mill Creek Station and the first long distance transmission lines in this section. Following this he pointed out how Los Angeles had grown electrically and told of the first electrical wholesaler there, the Hellman Hardware Company and of its "large" and "expansive" facilities—one little room. Mr. Woodill spoke on the subject of the first and largest users of current in those days and of some of the early members of the electrical business, some of them now members of the Electric Club, particular among them being R. H. Manahan now city electrician of Los Angeles, and E. R. Northmore, superintendent of distribution, Los Angeles Gas & Electric Corporation, and of the jobs they held in the early days.

Mr. McGarry pointed out how Los Angeles had grown in the interim, and stated that if it had not been for the development of hydroelectricity that Los Angeles could not today be the city it is. He told of the development of the 'back country' and how this had been made possible through the application of electricty and cheap power for the operation of electric railways, electrically operated pumps for irrigation purposes. Mr. McGarry was firm in his conviction that the present day prosperity of Los Angeles and southern California could not have been but for the development of hydroelectricity.

Mr. Spring presented some statistics showing the growth of the industry and of Los Angeles and stated that twenty-eight years ago E. R. Northmore had made a survey of Broadway between Temple and Seventh Street and reported there was not sufficient load available to warrant his company installing a pole line to take care of the meager load; yet today Broadway is one of the busiest streets in the country.

Commercial and Wiring Sections of N.E.L.A. Meet in Denver

The mid-winter meetings of the national commercial section and national wiring committee of the N.E.L.A. were held in Denver for the first time Jan. 24-26. Over fifty of the committee and bureau members were present, representing all sections of the country and especially the Pacific Coast and Atlantic seaboard states.

All meetings, with the exception of that of the wiring committee, were held in the offices of the Denver Gas & Electric Light Company, which company provided the entertainment for the visitors along with the Rocky Mountain geographic division of the N.E.L.A.

One of the features of the meeting was the dinner round-up the night of Jan. 25 when over 150 electrical men attended. The speakers of the occasion were Bill Goodwin, Samuel Adams Chase, George Hughes, A. K. Baylor, O. R. Hogue, R. S. Hale, and H. A. Lane. This meeting was sponsored by the Electrical Cooperative League of Denver.

COMING EVENTS

Pacific Division, Electrical Supply Jobbers' Association—
Quarterly Meeting—Del Monte, Calif.
Feb. 7-9, 1923

New Mexico Electrical Association—
Annual Meeting—Albuquerque, N. M.
Feb. 12-13, 1923

American Institute of Electrical Engineers—
Midwinter Convention—New York, N. Y.
Feb. 14-16, 1923

National Electric Light Association—
Annual Convention—New York, N. Y.
June 4-8, 1923

Pacific Coast Electrical Association—
Annual Convention—San Francisco, Calif.
June 19-22, 1923

The mid-winter social meeting of the Portland sections of the A.I.E.E. and N.E.L.A. was very well attended. Each year a special open meeting is held with the ladies in attendance. At the recent meeting, after a lecture by President P. L. Campbell of the University of Oregon on the subject of "The University and Practical Progress in Research," the floor was cleared and a dance was held. Announcement was made that due to illness, President Jewett of the A.I.E.E. would be forced to postpone his visit to the coast.

Electrical Convention to Be Held at Fairmont Hotel

The Fairmont Hotel, on Nob Hill in San Francisco, has been chosen as the meeting place for the annual convention of the Pacific Coast Electrical Association. The meeting will be held June 19-22, inclusive.

Plans are now being made by the men in charge of the convention to make the meeting of value to all members who are in the California city during the convention time. Entertainment and business meetings will be provided for the guests.

Annual Meeting Held by Oregon Hydroelectric League

Franklin T. Griffith, president of the Portland Railway Light & Power Company, was one of the principal speakers at the second annual convention of the Hydroelectric League of Oregon, which was held on Jan. 10 in Portland, Ore. Mr. Griffith spoke on the electrical future of Oregon.

The plans for the development of the Umatilla Rapids and the canalization of the Columbia River were outlined by Joseph T. Neal. Eugene Smith, chairman of the World's Electro-Industrial Exposition Company, gave a brief outline of the plans for the exposition which is to be held in 1927. The annual reports of committees and the election of officers were also taken up by the association members.

A grand ball will be given on Feb. 9, at the Goldberg-Bosley School for Dancing Hall, Sixteenth and Flower Streets, Los Angeles, under the auspices of the Electrical Contractors and Dealers Association of Los Angeles. The ball will be given for all members, and their families, of the electrical industry throughout southern California and it is expected that there will be several hundred couples present.

The annual meeting of the New Mexico Electrical Association will be held at Aubuquerque, N. M., on Feb. 12-13. Charles E. Twogood, of Albuquerque, is the secretary of the association.

The quarterly meeting of the Pacific Division of the Electrical Supply Jobbers' Association is to be held at Del Monte, Calif., Feb. 7-9. Problems confronting the supply jobbers will be considered at the meeting.

The name of the Southwestern Electrical & Gas Association has been changed to the Southwestern Public Service Association. The headquarters of the association remain at Dallas, Tex.

Fifteen new electric range installations will be served by a new distribution line which is being installed in the town of Selma by the San Joaquin Light & Power Corporation of Fresno, Calif. The line runs through territory where irrigation by electric pumping plants is necessary. A number of electric pumping installations may be put in during the spring.

Personals

D. W. Morgan, manager of the Las Cruces (N.M.) Electric and Gas Company has interested the Chamber of Commerce in his city in an ornamental street lighting system which already has been given the approval of Mayor A. I. Kelso.

H. A. Tewksbury of the Hendrie and Bolthoff Manufacturing and Supply Company assisted at the electrical home in Greeley, Colo., throughout its display.

J. L. White has been chosen to succeed **H. C. Shade** as manager of the electric store of the Portland Railway Light & Power Company. Mr. Shade will devote all of his time to the Investment Department, especially charged with the sale of prior preferred stock. Mr. White's experience with the electrical business has been largely in central station work. He was connected with the commercial department of the Portland Railway Light & Power Company from 1907-10 and spent the following eight years with the H. M. Byllesby Company at Albany, Ore., and other points in the Willamette Valley in an executive capacity. For the last four years Mr. White has been out of the electrical business, being employed until recently as the Portland manager of the Morris Plan System of Banking.

W. R. Putnam, vice-president and general manager of the Idaho Power Company and former president of the Northwest Electric Light and Power Association, presided over the highly interesting meetings of the commercial section of the National Electric Light Association which have just been held in Denver. Mr. Putnam is chairman of this group of the national organization. Mr. Putnam is one of the most active

W. R. PUTNAM

western utility executives in the affairs of the national body. Before becoming vice-president and general manager of the Idaho Power Company, he was sales manager and commerical manager for the Utah Power & Light Company. He received his early experience in the electrical industry as manager of the Red Wing Gas & Electric Company, Red Wing, Minn.

A. R. Heywood, of Ogden, chairman of the public utilities commission of Utah, and **A. A. Hinckley,** state agricultural commissioner, have been elected as delegates from Utah on the permanent transportation committee of the western states transportation organization. The permanent transportation committee to which the two Utah men have been elected, is made up of representatives of similar bureaus from the states of California, Washington, Oregon, Idaho, Arizona, Colorado, Montana and Nevada, which is to take up direct with the Interstate Commerce Commission and the railroads matters affecting transportation in the states mentioned in an attempt to avoid the annual car shortage for shipping perishables.

W. A. Alden has just recently joined the Los Angeles office of the Westinghouse Electric & Manufacturing Company in the Industrial and Commercial Lighting department. Prior to his joining the Westinghouse organization, Mr. Alden was, for a number of years, connected with the San Francisco office of the Benjamin Electric Manufacturing Company.

J. R. Deering, office manager of the Los Angeles office of the Westinghouse Electric & Manufacturing Company, and A. S. Duncan, general storekeeper of finished stock, East Pittsburgh works, are on a trip through Arizona and Texas in the interests of that company.

Carl L. Burgess, formerly of the Merchants National Bank of Los Angeles, has just recently joined the office of the Westinghouse Electric & Manufacturing Company as assistant publicity representative under **Carl M. Heintz,** publicity representative.

L. A. Blackburn, for the past six years with the Erner Electric Company of Cleveland, Ohio, has joined the sales staff of the Electric Railway & Manufacturers' Supply Company of San Francisco.

F. F. McCammon, of the Denver Gas and Electric Light Company and member of the Denver electrical cooperative league advisory board, has been elected a director of the corporation promoting and financing the Pageant of Progress to be held in Denver in July under the auspices of the leading industrial groups in that city.

Tully Scott, formerly chief justice of the Colorado supreme court has been appointed by Governor Sweet a member of the Colorado Public Utilities Commission of which **Grant Halderman,** a hold-over member, has been reappointed chairman.

J. F. Dostal, president of the Rocky Mountain division of the N.E.L.A. and manager of the Colorado Springs Light, Heat and Power Company is a member of the federal grand jury now sitting in Denver.

W. P. Southard, manager of the Trinidad (Colo.) Electric Transmission Railway and Gas Company, represented the southern Colorado utility interests at the meeting held in Denver Jan. 8 at which **Carl D. Jackson,** former prominent utility commissioner, was the speaker.

Clarence T. Ward, office attorney and secretary of the Idaho Power Company and the Boise Valley Traction Company for the past four and a half years, has resigned, and will open offices in Boise for the general practice of law.

Dr. L. F. Fuller has accepted a radio engineering appointment with the General Electric Company at Schenectady, N. Y., and will take up his new duties there as soon as work in California under his direction has been completed. The General Electric Company is devoting special attention to the possibilities of radio in various branches of the electrical industry. These range from

DR. L. E. FULLER

high power stations for transoceanic communication to carrier telephone systems for power companies and include the use of large thermionic tubes for power purposes, radio receiving equipment for the home, and the application of radio principles to power work generally. Dr. Fuller was for seven years with the Federal Telegraph Company and particularly during the war as chief engineer of that company did important development work on the high power magnetic arc transmitters which the U. S. Navy now uses for all transoceanic work. In this capacity he was also charged with executive duties and personally represented the company in negotiations on technical matters with the Navy Department at Washington, D. C. Stations designed and built under his direction are used for transmission over some of the longest distances spanned by radio communication. Notable among these is the link between Pearl Harbor, Hawaii, and Cavite, P. I., about 7,000 miles, and the high power transmitters located at San Diego, Panama, Annapolis, and Bordeaux, France. The last named, which was the last designed and built under Dr. Fuller's direction, has a rated capacity of 1,000 kw. Later, with C. B. Kennedy, he formed a partnership under the name of the Colin B. Kennedy Co., and has had an active part in the development of the line of radio receiving instruments bearing that name. For several years he has done radio consultation work in the East, as well as on the Pacific Coast, and recently was retained by the Great Western Power Company and the Pacific Gas & Electric Company, successively, to develop and install complete radio telephone transmitting and receiving systems, using 200-mile, high voltage power lines as carriers. Dr. Fuller was featured as a "Builder of the West" in the Journal of Electricity and Western Industry for Sept. 1, 1919, and was awarded the Morris Liebmann prize for 1919 by the Institute of Radio Engineers in recognition of his research and development work in radio engineering.

James L. Mahon, who for seven years has held the position of advertising manager of the P. A. Geier Company of Cleveland, was appointed merchandising manager of that company on January first. Prior to his connection with the Geier Company, Mr. Mahon was with the Buckeye Lamp Division, a branch of the National Lamp Works of General Electric Company.

W. W. Trench, assistant secretary of the General Electric Company, has been appointed secretary of the various committees which will administer the Charles A. Coffin Foundation, a fund of $400,000 which has been created by the board of directors of the General Electric Company, the income from which, approximately $20,000 a year, is to be employed in making various awards for meritorious service in the electrical field.

C. N. Stannard, vice-president and general manager of the Denver Gas and Electric Light Company, has been elected a director of the Tourists Bureau of the Denver Civic and Commercial association.

G. R. Thompson, formerly salesman with the Electric Appliance Company, of San Francisco, has recently left that company and is now acting as salesman for the Western Electric Company with headquarters in San Francisco.

H. W. Read, formerly of the Electric Corporation, Los Angeles, has recently joined the sales organization of the Illinois Electric Company as city salesman. Prior to Mr. Read's connection with the Electric Corporation he was with the Landers, Frary & Clark organization.

George W. Bixler, newly appointed director of publicity for the Denver Gas & Electric Light Company and the Cities Service Company in Denver, has been elected a director of the advertising bureau of the Denver Civic and Commercial Association. Although a newcomer to the publicity field, Mr. Bixler has for sometime been actively engaged in public relations work for

GEORGE W. BIXLER

his company. He is a native of Illinois and has been connected with the central station in Denver since 1905 when he entered the commercial department. Later he was transferred to the adjustment department. He is a former secretary of the electrical bureau of the civic and commercial association in Denver and an active member of the Doherty Men's Fraternity.

Frank H. Riddle, president of the American Ceramic Society and research engineer for the Jeffery DeWitt Insulator Company, Kenova, W. Va., and the Champion Porcelain Company, Detroit, delivered a highly interesting paper on "Ceramic Development of Porcelain Insulators" before a meeting of the San Francisco section, American Institute of Electrical Engineers, on Jan. 30. At the same meeting, **Dr. J. A. Jeffery,** president of the Champion Insulator Company, read a paper on "Development of Modern Methods of Firing High Voltage Porcelain." The same papers were read before a meeting of the Los Angeles section of the Institute on Feb. 2.

G. B. M. Medearis has been appointed district manager for the F. A. Clarke & Company (Good Housekeeping Shops, Inc.), at Long Beach, Calif. Before coming to California, Mr. Medearis was sales manager for the Iowa Gas & Electric Company at Washington, Iowa.

Richard Sachse, chief engineer of the California State Railroad Commission, is in Washington, D. C., appearing before the Interstate Commerce Commission in the matter of the unification of the terminal facilities of the Southern Pacific, Santa Fe and Los Angeles & Salt Lake railroads on the Pacific Coast.

Raymond W. Lillie, sales engineer for the Jeffery DeWitt Insulator Company of New York, is a recent Pacific Coast visitor.

T. E. Burger, for thirteen years connected with the Los Angeles and San Francisco offices of the Western Electric Company and more recently a member of the staff of the Society for Electrical Development, has been made sales manager of the company at Boston.

Ralph Wilder, Seattle, and **H. G. Gute,** San Francisco, divisional sales managers in their respective districts for the Birtman Electric Company, have recently returned from an executive sales conference of the company held at the Edgewater Beach Hotel, Chicago.

W. C. Sterne of the Municipal Properties Company, operators of several Colorado utilities, has named six Wyoming utility executives to the Rocky Mountain Committee on Public Utility Information, of which he is chairman. Those who will represent Wyoming on the committee are **H. L. Williams,** general manager of the Evanston Electric Light Company, **E. P. Bacon,** general manager of the Natrona Power Company, **F. H. Roberts** of the Popo Agie Light & Power Company, **J. J. Withrow** of the Sheridan County Electric Company, **E. C. Van Diest,** Western Public Service Company, and **Charles A. Semrad,** of the Western Light & Power Company.

C. P. Bowie, engineer in charge of the U. S. Bureau of Mines, has returned to San Francisco from an extended eastern trip.

Tom A. Rhodes, formerly of the Western Electric Company's Dallas, Texas, office, is now connected with the Los Angeles office of that company, in the sales department.

R. L. Eltringham, manager California Electrical Cooperative Campaign, San Francisco, has been in Los Angeles recently in the interests of the campaign, and while in the South, Mr. Eltringham delivered an excellent address before the Electrical Contractors and Dealers Association of Los Angeles.

A. N. Kemp, who for the past several years has been vice-president of the Southern California Edison Company, in charge of finance, has been elected senior vice-president of the California Bank of Los Angeles, and assumed his new duties on Feb. 1. Mr. Kemp became associated with the Edison Company upon the merger into that corporation of the Pacific Light and Power

A. N. KEMP

Corporation, having held the position of treasurer and controller of the latter company for several years. His duties with both of these companies, therefore, has been directly in connection with their financing and the sale of their securities, and the splendid record that he has made in this line has attracted wide attention. It was Mr. Kemp who directed the extensive and remarkably successful consumer partnership campaign of the Edison Company which resulted in nearly 50,000 investors becoming stockholders in that corporation. In forming a connection with the California Bank, Mr. Kemp is returning to a field of activity with which he is perfectly familiar by reason of long training and experience previous to becoming identified with public utility corporations, and in the words of President John B. Miller of the Edison Company, "His splendid traits of character and personality are bound to make him one of the leading factors in the California banking field."

V. L. Board, Harry Hughes, F. F. McCammon, all of the Denver Gas and Electric Light Company, **George E. Lewis,** executive manager of the Rocky Mountain Committee on Public Utility Information, and **S. W. Bishop,** executive manager of the Electrical Cooperative League, served as the committee in charge of all entertainment and arrangements incident to the national commerical section and wiring committee meetings of the N.E.L.A. in Denver, Jan. 24-26.

F. L. Stone of the power and mining department of the General Electric Company, Schenectady, is in Los Angeles on a business trip.

John W. Hancock, a Denver electragist, has been elected to the board of directors of the Kiwanis Club of that city.

John F. Greenawalt, publicity manager of the Mountain States Telephone and Telegraph Company, and **R. G. Gentry,** commercial manager of the Denver Gas and Electric Light Company, addressed the annual sales convention of the Mine and Smelter Supply company in Denver early in January.

Manufacturer, Dealer and Jobber Activities

The P. E. Chapman Electrical Works, St. Louis, Mo., has recently brought out what it calls the Allatonce Commutator Soldering Machine. The device will solder at one time all the joints of a commutator, a rotor of the long joints of container ends or any other device which requires considerable soldering, and faster than one joint can be soldered by hand. It eliminates the slow tedious soldering iron and instead uses a large volume of melted solder. The machine has an arrangement on which the commutator is placed which at once holds it and protects the shaft and ring insulation.

The Robbins & Myers Company, of Springfield, Ohio, has recently prepared for distribution to members of the electrical trade, its Catalog No. 1203. This booklet describes the design of the new Robbins & Myers line of fans. Illustrations of all fans described are presented in the catalog.

The Aluminum Cable Company of America has received an order for 110 pole miles of aluminum cable steel reinforced, to be used on the City of Seattle's Skagit River project, from the Gorge Creek power house to the municipal substation in the outskirts of the city. The new transmission line will have a capacity of 150,000 volts while the cable will be 477,000 cir. mils in area.

The National Tube Company, of Pittsburgh, Pa., has announced the establishment of an Industrial Fellowship in the Mellon Institute of Industrial Research of the University of Pittsburgh, Pittsburgh, Pa. This Industrial Fellowship is engaged in a systematic study of practical methods for the prevention of corrosion in hot-water supply systems. It is also giving attention to the relative corrosive action upon iron and classification of waters of various chemical composition, with respect to their steel, particularly in the form of pipe lines, boiler-economizers, tubes, etc. The present incumbent of the Industrial Fellowship is Clifford R. Texter, who for the past several years has been carrying out research on the corrosion of iron and steel, where not exposed directly to the atmosphere. Mr. Texter is prepared to correspond with engineers and manufacturers interested in the field to which his Industrial Fellowship relates.

The Art Metal Spinning Works is a new firm which has entered the lighting fixture field in Denver, Colo. The company formerly confined its business to spinning and electro-plating but has now gone into assembling and manufacturing fixtures for direct resale to dealers. Harry Smith is manager of the firm.

The Pittsburg Lamp, Brass & Glass Company may establish representation in Denver, Colo., to handle the Rocky Mountain business of the company.

The Hart & Hageman Manufacturing Company, Hartford, Conn., has placed a new fuse plug of the renewable type upon the market. The body of the plug consists of a fluted porcelain cap, into which a porcelain core is inserted. The porcelain cap carries the threaded brass member which fits the standard fuse receptacle. The separable porcelain core, which is hexagonal in shape, carries the fusible element and the pointed contact button. Examination of the fusible element may be instantly and easily made by slipping the core from the body-cap, exposing the fusible element to view. Should the fusible element be "blown," it is instantly discernible and a new core, carrying a perfect fusible element, can be inserted.

The Pacific Enterprise Company, of Pasadena, Calif., has been organizing a new electrical business in the southern California city. The company will be in the market for a complete line of electrical appliances and wiring supplies in the near future.

The Pacific States Electric Company has recently published a 20-page booklet intended to be distributed to home owners. The title of the booklet is "The Electrical 'How' for Householders." Electrical equipment for every room of the house is described in the booklet and advice as to use of the equipment is given to the housewife.

The Louis Allis Company, of Milwaukee, Wis., has recently placed on the market the new L-A motor type H.D. which has an entirely new principle of rotor construction. The winding of the rotor consists of an integral sheet of copper, punched and formed by a special mechanical process. This one-piece winding is machine-wrapped around the rotor core, the copper bars being expanded into the core slots by swaging. The single joint which extends through the two end rings, is silver welded, after which the metal at both connections is processed by means of a contracting operation that rehardens the copper at the joint where the heat applied during the welding, softened it.

The Ohio Brass Company, of Mansfield, Ohio, has recently published its catalog concerning its line of Imperial headlights. The catalog is very complete and describes the entire line.

The P. A. Geier Company, of Cleveland, Ohio, has announced that Alexander Mueller, of the firm of Rising & Rising, Los Angeles, is the winner of the first prize of $500 in the recent Royal Cleaner sales campaign. The Pacific Coast is represented on the roster of winners by a long list, including William C. Critz of San Francisco, who stood third and received $400, E. B. Mills and H. V. Otter of Portland, James B. Keegan and B. T. Franklin of San Francisco, and J. Morrow of San Diego. Thirty-three cash prizes were given in all, totaling $5,360. The electric cleaner for Christmas idea was used with marked success in this campaign.

Hubbard & Company, of Pittsburgh and Chicago, has recently placed M. M. Johnson in charge of its Denver, Colo., headquarters. The development of the Rocky Mountain territory for pole line hardware necessitated the establishment of district representation. Mr. Johnson will work under the direction of Earl Wessel, who is the western sales manager, located at Chicago.

The Power Specialty Company, of New York, has recently placed R. B. Nutting, formerly Chicago district manager, in charge of the Rocky Mountain territory. Mr. Nutting's headquarters are at 2324 Fourteenth Street, Boulder, Colo.

The Western Electric Company will move its Anaconda, Mont., office to the building recently vacated by the post office. It is expected that the company will be able to move shortly after the first of the month as remodelling of the building should be completed by then.

THE INTERNATIONAL RACE PROBLEM

Time: Recent Jobbers' Convention. **Place:** The Race Track at Tia Juana, Mexico. **Cast of Characters:** From left to right—F. N. Averill, president, Fobes Supply Company, Portland; H. L. Bargion, Montana Electric Company, Butte; R. W. Murphy, San Francisco district manager, Westinghouse Lamp Company.

Murphy: "I have the inside dope straight from Barney Google that 'Sprakplug' is a cinch to win."

Bargion: "According to the constitution of the League of Nations which I hold here, 'Moonshine' will not figure today."

Averill (thinking of what the Governor of North Carolina said): "I'm backing 'Old Crow' against the field."

Trade Outlook

San Francisco

After experiencing record Christmas sales, dealers in San Franisco are busy stimulating trade through stock-reducing sales. Business is active and the prospects for the year are very bright. Collections are good and installment and credit houses state that their debits greatly exceed those of last year.

Jobbers report that dealers are settling their accounts rapidly and that there are few delinquents among their customers. Stocks of merchandise are being replaced slowly as conditions warrant. The principal demand seems to be for the better grade of merchandise regardless of the higher price.

The trade commission of the San Francisco Chamber of Commerce, sailed for South American ports on Jan. 25. It is thought that the good relations which will be secured by the men of this party with the business firms of the South American republics will react to the benefit of the entire city. More frequent and regular sailings between San Francisco and the eastern coast of South America have been established and will prove to be a trade aid to the city.

Indications are that the interest rates on San Francisco real estate mortgages will be reduced through the year. Should this happen it will have a very decided effect upon building in the city. That the activity of 1922 would be surpassed if cheaper mortgage interest rates could be secured, is a fact admitted by many men interested in building trades and real estate.

Seattle

Extremely heavy rains in various parts of Oregon and Washington caused serious flood menace, but developed comparatively little damage in Washington. Washington lumber mills and logging camps resumed operations the first week in January, completing the shortest holiday shut-down in many years. A feature of the report for the first two weeks in January was a marked proportionate increase in orders for future rail delivery. Sixty-eight per cent of all sales was made in rail markets. Prospects for the early months of the year in the lumber industry are excellent, and with continued open weather, manufacturers expect to continue steady operation.

Electrical jobbers and dealers report a very satisfactory holiday season, and jobbers enter the new year with stocks in many lines exhausted. Radio material, heating appliances, percolators, waffle irons, (always favorites), were leaders this year. Christmas buying in all lines was unusually heavy in Seattle, and department store owners report a very successful Christmas season. There is an increasing tendency to make the Christmas gift an electrical one, due partly to persistent advertising by numerous local concerns, and also, is is believed by the attractive show windows exhibited by some of the well-equipped houses.

Building construction is proceeding in all lines of new work, including several very important large structures. A number of new apartments are under way, and the residence construction is evident in all parts of the city, creating a satisfactory demand for lamps, schedule material and fixtures.

Portland

The power companies of Oregon, for the most part, are busily planning ways and means for caring for the winter loads of 1923-4. There is already a marked shortage of capacity in certain sections due to the unexpected increase in load. Much new generating equipment and many new lines will be needed.

Prospects for new building construction in Portland during 1923 are most promising. The year just closed topped all former records and the new year is expected to surpass 1922 with a probable increase in the percentage of industrial building.

Reports from 125 lumber mills for the week ended Jan. 13 shows production 16 per cent above normal with business 52 per cent above production and shipments 14 per cent below new business. About 40 per cent of the shipments are moving by water. The annual payroll for the Oregon lumber industry in 1922 was in excess of $40,000,000.

Headed by the Portland Chamber of Commerce, a fund of $300,000 is being raised for state development. Special studies will be made to determine the best methods of marketing, land settlement and state publicity.

Salt Lake City

The ready market found for Columbia Steel Corporation bonds, in the amount of $4,000,000, assures the beginning of construction work on this project at the earliest possible moment. This new steel industry will be a very material factor in stimulating business activity.

Business conditions in the intermountain section are still maintaining their improved trend.

There has been a notable increase in the use of electric power in industry, especially in the mining centers. Production at the Utah Copper Company's property at Bingham, Utah, is being constantly increased, with the favorable copper market existing, and indications are that this company's operations will continue to increase.

Electrical dealers and merchants in general continue to report a fair volume of business for this time of the year.

Due to very mild weather some building operations are in progress, and it is predicted that the coming spring and summer season will see unprecedented activity in the building line.

Denver

Denver's building program continues unabated. Extremely fair weather has held up construction thus far and with new plans and projects announced the record established last year will be equaled, according to architects, building supply houses and others.

A serious fire which completely destroyed the warehouse of one of the large local jobbers has had its effect on the supply of some electrical items since last week. Emergency stocks have been secured and through the cooperation of the other Denver jobbing houses business has been handled as usual. Fortunately, stocks had not been replenished after inventory or otherwise the loss might have exceeded the hundred thousand dollar mark.

Appliances are moving slowly as an aftermath of the holidays. A special campaign is being waged on irons of the standard makes while several dealers have moved considerable non-standard material which has been accumulating for a number of years. Washing machines and vacuum cleaners have been moving better since the national stock show here the middle of January.

The announcement that a twelve million dollar power generating and distribution system would be built near Boulder, Colo., shortly by the Doherty interests has stimulated the industry. Orders have already been placed for part of the generators and boiler equipment. The transmission lines will require large shipments of wire, pole line hardware and transformers early this year as options have been closed on the plant site and construction will be started shortly.

Los Angeles

Building activities for Los Angeles for the new year have made a good start, favored by fine weather. Up to and including Jan. 15, the building permits issued numbered 2,164 with an estimated valuation of $4,774,327, while for the same period last year, the number of permits was 1,695 with a valuation of $3,542,511.

Bank clearings for the first fifteen days of January amounted to $257,156,769.17 which compares with the same period of 1922 with $196,035,713.74 as an increase of about 30 per cent.

Local jobbers and retailers of electrical supplies continue to report excellent sales in this city and throughout southern California. There has been a slight decrease in the sale of appliances since the Christmas holidays but this has been imperceptible compared with former years. The holiday trade in this regard was the greatest in the history of this section, while the bright outlook in the building trades augurs well for the continued sale of electric wiring devices and supplies. A huge power development is under way for the coming year which will necessitate the expenditure of large sums for power equipment and apparatus and the representatives of manufacturers are genuinely optimistic.

Radio supplies and apparatus, particularly parts, are experiencing large sales and this in a measure is due to the continued success of the powerful distributing stations that have been installed in Los Angeles during the past few months.

Construction News

Buildings (Industrial)

Calif., Palms—The Brogdex Company of California, manufacturers of preservative for fresh fruits, is considering the erection of its main plant at Palms, near Culver City. Riverside had formerly been selected, but will be only one of the branches. The company is capitalized for $1,000,000. Members of the company are: H. F. Keenan, Walter J. Wallace, H. W. Keller, F. C. Van Dise, D. M. Brogdex, A. L. Schwarz and L. H. Henry.

Calif., Santa Barbara—Shell Oil Company of California will expend about $1,000,000 for the erection of a distributing plant and four filling stations in the vicinity of Santa Barbara. The distribution plant will be located on a recently purchased tract on Salispuedes near Milpas St. L. T. Kittinger is district manager of the company.

Calif., San Pedro—Motor Ship Service Corporation is planning to erect a terminal building or group of buildings at San Pedro to cost $750,000. The company, recently incorporated for $1,000,000, is engaged in carrying fruit and will run between the Pacific and Atlantic coast ports. Special refrigerating machinery will be installed in the proposed building. Maurice Selig of San Francisco is president, Walter S. Wheaton, vice-president, and B. R. Douglas, Los Angeles, commercial agent. A site is being selected now.

Calif., Los Angeles—Hamm & Grant, Ferguson Building, have prepared preliminary plans for a woolen mill to be erected in Los Angeles by Lemuel J. Coburn. The plans provide for a mill building, 150 x 600 ft., and a 2-story office building, 40 x 80 ft.; the site has not been definitely selected.

Calif., Los Angeles—Moran Company, Kerckhoff Building, has the contract to erect a 2-story factory on Towne Ave., near Agatha St., for Los Angeles Brush Company. It will be brick construction, pressed brick facing, plate glass, structural steel, steel sash, composition roofing, metal skylights; $30,000.

Calif., Los Angeles—Architect Albert C. Martin, 430 Higgins Building, is preparing plans for a 5-story and basement class A warehouse, 100 x 350 ft., to be erected at San Pedro and Commercial Streets for Los Angeles Warehouse Company. The one-story warehouse, for which bids were asked a short time ago, will not be built. Plans for the five-story building will be ready for figures in 90 days. It will be of reinforced concrete construction, steel sash, metal skylights, steel rolling doors, sliding metal doors, 1 passenger and 4 freight elevators, automatic sprinkling system; $350,000.

Calif., Los Angeles—The Austin Company, 702 Pacific Electric Building, has the contract to erect a second unit of the factory buildings for E. H. Rosenthal on Utah Street north of 7th St. It will be 125 x 120 ft., class C construction, composition roofing, metal skylights, steel sash, cement floor; $25,000.

Calif., Los Angeles—Architect Albert C. Martin, 430 Higgins Building, has completed plans and is taking general bids with structural steel, electric wiring and plumbing separate, for the erection of a 2-story class C warehouse, on East 7th St., east of Santa Fe Ave., for the Republic Supply Company. Brick, 60 x 300 ft., composition roofing, cement and hardwood floors, steel beams, pressed brick front, steel sash, wire glass; $60,000.

Calif., Los Angeles—The Austin Company, 702 Pacific Electric Building, has prepared plans and has the contract to erect a 1-story and part 2-story class C brick automobile building on Jefferson St. near Hill St., for R. B. Lloyd. It will be 123 x 124 ft., the 2-story section extending back 96 ft.; brick walls, rugged brick and cast iron facing, plate glass windows, steel beams, concrete and reinforced concrete floors, composition roofing, steel sash, metal skylights, sprinkler system; $90,000.

Calif., Santa Rosa—A $100,000 addition to the National Ice and Cold Storage plant on Sebastopol Avenue is to be constructed, according to Superintendent J. J. Flynn.

Calif., Bakersfield—A new cement plant to cost approximately three million dollars, is to be established in Tehachapi by Henry Cowell Lime & Cement Company, it was brought out by A. M. Frost, a representative of the San Joaquin Light & Power Corporation of Fresno, in a general discussion of the Civic Commercial Association.

Calif., Los Angeles—Architects John Parkinsan and Donald Parkinson, 420 Title Insurance Building, have completed plans and are taking bids for erecting an addition to the Ford Assembling plant at East 7th Street and Santa Fe Ave., for Ford Auto Company. The building will be 2-story, 132 x 349 ft., reinforced concrete frame, floors and roof slab, brick filler walls, pressed brick and terra cotta facing, plate glass, steel sash, steel roof trusses, steel rolling doors.

Calif., Anaheim—Frank K. Benchley, Fullerton, is preparing plans for a citrus packing plant to be erected in Anaheim for the Anaheim Valencia Growers' Association, with W. L. Benchley, of Fullerton, as chief owner and manager. The building, which will be on the Santa Fe tracks, will be 90 x 130 ft., and cost $30,000. Equipment will cost about $7,000. Work will start at once.

Calif., Los Angeles—Gay Engineering Company, 2650 Santa Fe Ave., Los Angeles, has contract and has broken ground for a concrete ice factory, 59 x 104 ft., at 240 No. San Fernando Road, for Union Ice Company, 660 So. Alameda St., Los Angeles; plans by Architect Myron Hunt, Los Angeles.

Calif., Los Angeles—W. H. Daum, Van Nuys Building, has purchased a tract of 240 acres bounded by Central, Florence, Slauson and South Park Avenues, as an industrial tract. Street improvements to cost $250,000 will be installed and Mr. Daum states that arrangements have been concluded with fifteen manufacturing companies to erect factories in the tract at a cost of $5,000,000.

Calif., Los Angeles—Lepper & Laisy, 501 O. T. Johnson Building, have the contract to erect a 2-story brick factory building on Long Beach Ave. Chas. M. Hutchinson, Security Building, architect. It will be 80 x 240 ft.; cost, $50,000.

Calif., Los Angeles—Associated Builders Company, 818 Chapman Building, has the contract to erect a 1-story brick factory building on Newton Street near Central Ave., for Kwality Feather Company. It will be 50 x 135 ft., brick walls, pressed brick facing, plate glass, steel beams, comp. roofing, metal skylights, cement floors; $8,500.

Calif., National City—Western Cotton Products Company has been organized by B. B. McCall, Jr., a cotton man from the south, and has purchased the site of the old Nordof China Products plant at 7th Ave. and 12th St. through J. E. Blackman & Son, real estate firm. Buildings will be erected and $50,000 cotton machinery purchased and installed.

Calif., Bakersfield—Plans for the expenditure of $50,000 in improving its plant at Toby, near Mojave, have been announced by the Frement Salt Company, which has just elected the following directors: H. P. Oldham, J. C. Martin, R. Libby, et al.

Calif., Los Angeles—Clark-Hass Company, 3rd St. and Western Ave., has the contract to erect a 1-story office and warehouse building at 31st and San Pedro Sts. for Tyre Brothers Glass Company. Plans by L. A. Smith, 3rd St. and Western Ave. The building will be 150 x 265 ft., brick walls with pressed brick and plaster facing on both street fronts, frame and galvanized iron on the other two sides, comp. roofing, metal skylights, steel sash, cement floor; $60,000.

Calif., South San Francisco—The Metal & Thermit Corporation of South San Francisco is planning the erection of a large sheet metal rolling plant, to cost $2,000,000. The new plant, which will adjoin the present holdings of 12 acres, will cover an area of 14 acres. Work will start at an early date. E. W. Kardos is district manager of the Metal & Thermit Corporation.

Calif., Hollywood—Architect Wm. F. Bowen, 813 Union League Building, has completed plans for an ice storage building at Santa Monica Blvd. and La Brea Ave., Hollywood, for the Home Ice Company. Dimensions, 40 x 78 ft., reinforced concrete and steel construction, stucco exterior, 42 ft. high, reinforced roof construction, maple and concrete floors, cork insulation, cooling tower, high pressure piping, elevator and conveyors, ornamental iron; $50,000.

Calif., Los Angeles — Davidson Construction Company, 1445 E. 16th St., has been awarded the general contract at about $268,000 for erecting two class A warehouse and factory buildings on E. 7th St. near Anderson St., for Peck & Hills, wholesale furniture dealers. Albert C. Martin, 430 Higgins Building, is the architect. The buildings have been changed from 3-story to 4-story and basement each; dimensions, 80 x 100 ft. and 125 x 250 ft., respectively; concrete construction, steel sash, metal skylights, steel rolling doors, sprinkler system.

Ore., Bend—A veneer plant costing $25,000 will be built by an eastern manufacturer whose plant in the East has ceased operating because of lack of timber. His new plant will handle 15,000 ft. daily. Announcement made by L. Antles, of the Bend Commercial Club.

Ore., Portland—The Columbia Cement Company has recently been incorporated under a capitalization of $2,000,000 and has its headquarters in Portland. One of the largest cement plants west of the Missouri River is to be constructed immediately on the holdings of the company west of Huntington, Ore. Engineers are now on the ground making a survey of the property.

Ore., Astoria—The Astoria Shope Brick Company will begin work on a new industrial activity. The site has been purchased and the company has incorporated for $250,000. The establishment will turn out 35,000 common brick or 15,000 face brick every eight hours, and at the start they will employ from 25 to 30 people.

Ore., Portland—Plans for a modern confectionery establishment are being prepared by A. E. Doyle, architect, for the Portland Hazelwood Company. The new building will be located at East Broadway and Wheeler Sts., occupying a space of 100 x 100 ft. The cost of the building has been estimated at $100,000.

Ore., Salem—A farmer warehouse, the estimated cost of which will be $30,000, is to be erected at the corner of Trade and Liberty Sts. by Paul Traglio of Salem. The building will be of reinforced concrete and will be two stories high, having 7,500 sq. ft. of floor space.

Ore., Medford — The Southern Oregon Bi-Products Company will be the name of a new organization which will build a factory west of

the city limits on the Jacksonville railroad for the evaporation of fruits. Construction work will be rushed to completion to be in readiness for next season's crop.

Wash., Birmingham—Plans for immediate establishment and operation of an overall factory in this city have been completed, the company to be known as the Birmingham Garment Manufactoring Company. The plant of the Manning-Wyman Overall Factory of Butte has been purchased and will be moved to Birmingham, where it will be enlarged and developed. The company has purchased the entire townsite and plans to develop a model city for its employees. The plant will start with 20 machines, which will be rapidly increased.

Wash., Tacoma—Furniture Factory—The Gregory Furniture Manufacturing Company has announced plans for the immediate construction of two new buildings which will greatly increase the size of their present plant and which will be modernly equipped with new machinery. The larger of the new buildings will be a two-story, reinforced concrete structure, 205 x 80 ft. in size; the second building to be reinforced concrete, 40 x 100 ft.

Wyo., Torrington—Construction of a 1,000-ton beet sugar factory which will be in operation next fall will be started shortly by the Goshen Sugar Company. Units will be individual electric drive. Justice George W. Allen of the Colorado Supreme Court is president of the company, which has the backing of the Lincoln Land Company. Carl Clinton of this city is one of the incorporators.

Buildings (Miscellaneous)

Ariz., Phoenix—Offices—Trost & Trost, architects of El Paso, are drawing the plans and bids will be called to be opened about March 1 for the 10 or 12-story office building, to be erected at the southwestern corner of Central and Jefferson Streets by George and Arthur Luhrs. Cost of building estimated at $750,000.

Ariz., Miami—School—Trost & Trost, El Paso, Tex., are taking bids on a high school building to be erected in Miami, Ariz., and for a grade school to be erected in Buena Vista school district, Ariz. Estimated cost, $150,000.

Calif., Livermore—Hospital—The United States Veterans' Bureau has rejected all bids tendered for the erection of hospital buildings in Livermore, according to word received from James H. MacLafferty, Congressman. The bids were rejected because they were $600,000 over the estimate. The bureau will immediately call for new bids, and hopes to have returns on them within the next two weeks.

Calif., San Francisco—Institution—John Reid, Jr., city architect, has been directed by T. A. Reardon, president of the board of public works, to prepare plans and specifications for the new $2,000,000 Relief Home for which bonds were voted on Nov. 21. Work on the plans will be begun so that preliminary details of the construction may be ready when the funds are available, six months hence.

Calif., Vacaville—School—Trustees of the Vaca Valley Union School District have rejected all bids for the erection of an additional school building. Herndon & Finnigan, Sacramento, were the lowest bidders. It was decided to call an election for the purpose of submitting an additional bond issue of $24,000.

Calif., Taft—Schools—Bids will be called at once for the construction of a group of six reinforced high school buildings, for the Taft union high school district, Kern County, in accordance with plans prepared by Architect W. H. Weeds, 369 Pine St., San Francisco. The group will include auditorium, gymnasium, science bldg., domestic science bldg., shops, added to present school bldg. Construction will be of reinforced concrete with terra cotta tile roof. The work will be divided into the following propositions: Excavating and concrete structural iron and steel, terrazzo tile, carpentry work, glass and glazing, lathing and plastering, terra cotta tile roof, venetian blinds, electric wiring, furniture, cafeteria kitchen equipment, sheet metal work, painting, lighting fixtures, composition floors, steel lockers, marble work, masonry work, blackboards, finish hardware, comp. roof, window shades and cork carpets and linoleum, special fixtures, plumbing, heating and ventilating, stage equipment. A deposit of $20 will be required for the plans and specifications which may be obtained from the architect after Jan. 11.

Calif., Los Angeles—County Museum—The Allied Architects' Association is conducting a competition among its own members to obtain a comprehensive plan for a greater museum to be erected at Exposition Park by Los Angeles County. The first plans were submitted on Jan. 29 for criticism by the members. Further plans will be prepared and the final scheme developed in the same manner that the design for the County Hall of Justice was developed. The complete museum will cost several million dollars and its construction will extend over a period of years. It is planned to erect the first unit of the building this year from funds which are now available.

Calif., Ventura—Lodge—Architect Alfred F. Priest, 719 Fay Bldg., is preparing plans for a new store and lodge bldg. to be erected at Ventura for Ventura Elks' Lodge. The first story will contain 4 stores; banquet room on the mezzanine floor; lodge rooms, social rooms, ladies' parlor, lounge and billiard rooms in the second story, and 16 dormitory rooms in the third story; 100 x 150 ft., brick construction, pressed brick and terra cotta facing, plate glass, structural steel, etc.; $120,000.

Calif., Los Angeles—Apartments — Architects Walker & Eisen, 325 Pacific Finance Bldg., are preparing plans for a 4-story and basement class C apartment house to be erected at northeast corner of 8th and Catalina Sts., for Chas. Isaacs. It will be 150 x 120 ft. and will contain 120 rooms arranged in suites of 2 and 3 rooms each; $160,000.

Calif., Modesto — Post Office — Keyless Lock Company of Indianapolis was awarded contract by Modesto Post Office in new bldg. which the association is erecting. It will be 1-story, 60 x 100 ft. The equipment includes furniture, boxes, etc.

Calif., Fullerton — Auditorium — Community Service of Fullerton proposes to erect a community auditorium. Architect Frank Benchley of Fullerton is president of the organization. A recent meeting was held at the city hall to formulate plans for securing the proposed building.

Calif., Alhambra — School — Bids have been called for and received by the board of education of Alhambra City high school district for erecting new auditorium and class room bldg. at Alhambra high school. Hunt & Burns, 701 Laughlin Bldg., architects. Bids will be taken for all work complete in one contract and also for 12 segregated contracts. The bldg. will have a frontage of 300 ft., E-shaped with three wings, the auditorium wing being 170 x 115 ft., and the class room wings each being 62 x 120 ft., 2-story and basement, brick construction, plastered exterior, comp. roofing, pine trimming, maple floors, reinforced concrete stairways and corridor floors; $350,000.

Calif., San Pedro—Store—Offices — Milwaukee Building Company, 315 Wright & Callender Building, has prepared plans and has a contract at about $97,000 for erecting a 2-story brick store and office building at northwest corner of 6th and Mesa Streets, San Pedro, for Ethel K. Patterson, 4825 Van Ness Ave. It will be 100 x 125 ft., brick walls, pressed brick and terra cotta facing, plate glass windows, steel beams, comp. roofing, metal skylights, pine trimming, lavatories, etc.

Calif., Los Angeles—Club—Architects Allison & Allison, 1405 Hibernian Building, have been selected to design the new club building to be erected on Flower Street between 8th and 9th Streets, for the Women's Athletic Club, 400 Junior Orpheum Building. The building will be of class A construction, but the height and other details will not be determined until preliminary plans are prepared.

Calif., Fullerton — Church — Noerenberg & Johnson, 401 Los Angeles Railway Building, have been commissioned to prepare plans for a group of church buildings to be erected at the corner of Pomona and Amerige Aves., Fullerton, for the Methodist Episcopal Church. There will be seven buildings, of masonry construction; cost, $250,000.

Calif., Santa Ana—Club—Architect Frederick H. Eley, Santa Ana, is preparing plans for a 3-story and basement class A club building to be erected at Church and Sycamore Streets, for the Y. M. C. A. It will be 110 x 120 ft., have concrete foundation, stucco finish exterior, tile roof, O. P. trim, concrete floors, tile mantels, tile showers and gas-steam heating, automatic heater, reinforced steel, metal lath, art stone, waterproofing, sidewalk lights, fire escapes, ornamental iron, boilers, steel sash in basement and gymnasium. Estimated cost, $175,000. Plans will be ready for bids about Feb. 1.

Calif., Bellflower—Bank—Hotel—Architect W. J. Saunders, 227 Laughlin Building, is preparing plans for a 2-story class A bank and hotel building at Bellflower for F. E. Woodruff. The first floor will contain bank, lobby and 8 rooms; the second, 46 rooms. Brick, 56 x 110 ft., pressed brick front, comp. roofing, cement, O. P. and hardwood floors, gas radiator heating, water heater, plate glass, ornamental iron, concrete vault.

Calif., Inglewood—City Hall—Architects Train and Williams, 226 Western Mutual Life Bldg., have been commissioned to prepare plans for a 2-story class A City Hall building at Inglewood for the city. Brick, pressed brick front, art stone trimming, tile roofing; $45,000.

Calif., Sacramento—Store — Preliminary plans are being drawn for a wholesale grocery establishment to be erected at Third and R Streets, according to recent announcement made by Mrs. Mary Lindley, of Lindley & Co., pioneer wholesale grocers. Cost of the building, which will contain the most modern equipment, is estimated at $100,000.

Calif., Huntington Park — Store—Lodge — W. M. Bell, Douglas Building, was low bidder at about $120,000 for erecting new store and lodge building at Huntington Park for Huntington Park Elks' Lodge. Whipple & MacDonald, Huntington Park, were next low bidders. Both bids were held under advisement until the building committee could determine if low bid was for all work complete. A. H. McCulloch, Delta Building, architect.

Calif., Elk Grove—Hall—The Native Sons' Hall Assn. is considering final plans for the erection of a three-story hall, hotel and business structure, to cost approximately $50,000. J. C. Peterson, architect.

Calif., Sacramento—School—Preliminary plans have been prepared for a parochcial school for St. Francis parish, to cost between $100,000 and $125,000, building to start in February. The building will be of reinforced concrete, three stories in height, and is to be erected at the southeast corner of 25th and K Streets.

Calif., Lodi—School—Contract for the construction of additions to the Lodi Union High School has been awarded to Charles Maybrey Company, of Sacramento, on their bid of $216,-324. The additions include an auditorium and a science building, each 125 x 175 ft.

Calif., Placerville—School — A bond election for $160,000 for the construction of a new high school building will be held on Feb. 3.

Calif., San Bernardino — Store — Offices—Bids are being received by Architect De Witt Mitcham for constructing brick store and office building.

on Fourth St., for J. Dale Gentry, owner. The building will be 150 ft. deep, 2-story, the second set back 50 ft. from front, of brick construction, with terra cotta cornice and trimmings. The first floor will contain Ford and Lincoln agency sales room, with 16 offices on second floor. Estimated cost, $65,000.

Calif., Los Angeles—Store—Offices—Lange & Bergstrom, Washington Building, will be the contractors for the class A store and office building to be erected on 8th St., extending from Spring St. to Main St., for Central Finance Company. Walker & Eisen, 325 Pacific Finance Bldg., architects. The building will be 13-story and basement, steel frame or reinforced concrete construction; $450,000.

Calif., Santa Monica—Apartment-Hotel—M. P. Rapp, 224 Santa Monica Blvd., and Guy K. Harrison, formerly of Denver, have purchased property at the corner of Ocean and Montana Avenue from D. A. Hamburger, and are having plans prepared for a 7-story class A apartment-hotel, costing $500,000, which they will erect on the site. The building which is to be on the Palisades, directly overlooking the ocean, will embody every modern apartment convenience and will have a high-class club on the top floor.

Calif., Hanford—Offices—Architects Ernest J. Kump & Company, Rowell Building, Fresno, are preparing plans for a 2-story business block and office building to be erected on Irwin St., between 8th and 9th Streets, for F. N. Isaac. It will be known as the Wealth Center Building. Estimated cost, $100,000. The building will contain about 23,500 sq. ft. floor space, and will be of brick construction with plate glass store fronts.

Calif., Los Angeles—Store—Offices—Wm. M. Garland, 749 So. Spring Street, contemplates the erection of a 12-story class A store and office building at northwest corner of 9th and Spring Streets. The site is 60 x 155 ft. An architect has not yet been selected.

Calif., Los Angeles—Apartments—Architects Walker & Eisen, 325 Pacific Finance Building, have prepared plans for an 8-story and basement class A apartment house to be erected at the southwest corner of 6th and Park View Sts., for Lange & Bergstrom, Washington Bldg. It will be 120 x 150 ft. and will contain 250 rooms arranged in suites of two and three rooms each. The cost will be $600,000. Actual construction work was commenced Jan. 15.

Calif., San Francisco—Depot—The U. S. Marine Corps is planning the construction of a three-story depot on Harrison Street, between Spear and Main, at a cost of $335,000. Old buildings on the site will be removed about July 1 and it is expected that construction work on the new building will start shortly thereafter. The building will cover 100,000 sq. ft. and will be used as headquarters not only for the department of the Pacific but also all other marine corps activities in San Francisco will be housed in the proposed building. Lieut.-Col. N. G. Burton, quartermaster of the Department of the Pacific, U.S.M.C., has present headquarters at 36 Annie Street.

Calif., Los Angeles—School—Architect Chas. M. Hutchison, Security Building, has completed plans for a new school building to be erected at East 2nd Street school site. It will contain 16 rooms, brick construction, ruffled brick facing, slate roofing, pine trim, reinforced concrete stairways and corridor floors; $116,000. The board of education will advertise for bids shortly.

Calif., Los Angeles—School—Architects John Parkinson and Donald B. Parkinson, 420 Title Insurance Building, are preparing working drawings for the new Beverly High School to be erected at Melrose and Fairfax Avenues. It will contain 60 rooms and an auditorium to seat 1,800; dimensions, 450 x 320 ft.; brick and reinforced concrete construction, selected common brick facing, cast stone trim, clay tile roofing, pine trim, marble and tile work, reinforced concrete floors and stiarways; $600,000.

Calif., Los Angeles—School—Architects Morgan, Walls & Morgan, 1124 Van Nuys Building, are preparing working plans for the new building to be erected at Polytechnic High School site. It will be 3-story and will contain 24 class rooms and an auditorium to seat 2,000; $340,000.

Calif., Los Angeles — Store — Architects John Parkinson and Donald B. Parkinson, 420 Title Insurance Building, are commencing the preparation of plans for the addition to be erected on Fourth Street for the Broadway Department Store. It will be 80 x 125 ft., 11-story, mezzanine story, basement and sub-basement, steel frame and brick construction, reinforced concrete floors, pressed brick and terra cotta facing, plate glass, 8 passenger elevators, truck elevators, etc. It is also planned to add one or more stories to the present building and to install escalators.

Calif., Long Beach—Hotel-Apartments—Architect Alex Curlett, 518 Merchants National Bank Bldg., 6th and Spring Streets, Los Angeles, has prepared preliminary plans for a $2,000,000, 12-story, class A, own-your-own hotel and apartment building to be erected on Ocean Avenue between Atlantic Avenue and Lime Way, Long Beach, for the Milton Realty Company, 114 Locust Avenue, Long Beach. The building will be 240 x 100 ft. and will contain 250 apartments and 100 hotel rooms. The company includes Jack Milton, O. C. Hurst, J. C. Wickham and J. E. Pamplin.

Calif., San Francisco—Lodge—Plans for a 13-story club house and home, to be started in the near future by San Francisco Lodge, No. 3, Benevolent and Protective Order of Elks, have been submitted by Architect Fred Meyer. The proposed building and the site will be valued in excess of $1,000,000, being located on the north line of Post Street, between Powell and Mason Streets.

Calif., Fullerton—Store—Offices—John Simpson, 701 San Antonio Ave., Los Angeles, submitted low bid to C. C. Chapman, Fullerton, at $172,000, for constructing 5-story, class A reinforced concrete store and office building to be erected in Fullerton.

Calif., San Francisco — Offices — The Spring Valley Water Company is planning the erection of a 7-story office building to house the city departments of the organization, to be erected on Mason Street, between Geary and Post Sts. Willis Polk is architect and builder.

Calif., Los Angeles—Store—Architect John M. Cooper, 321 Marsh-Strong Building, has completed plans and has the contract to erect a 2-story and basement brick store building on Hill St., south of 9th St., for Richards Bros. It will be 50 x 150 ft.; cost, $50,000.

Calif., Los Angeles—Offices—Milwaukee Building Company, 315 Wright & Callender Building, is preparing plans for a 12-story, class A office building to be erected on Hope St. south of Pico St., for K. B. Norswing of Fullerton. The site adjoins the Lutheran Hospital property and the building will be designed for occupancy by physicians and surgeons. It will be 75 x 175 ft., steel frame construction, brick filler walls,, pressed brick and terra cotta facing, reinforced concrete floors, elevators, steam heating, etc. Cost, $750,000.

Calif., Los Angeles—Stores—Milton G. Cooper Dry Goods Company (Cooper, Conte & Casey), 700 So. Los Angeles St., has purchased a site on 9th St. extending from Los Angeles to Santee Sts., and contemplates the erection of a 12-story, class A mercantile building. The architect has not been selected as yet.

Calif., Bakersfield—Hospital — Wm. G. Reed, 310 Loma Ave., Long Beach, was low bidder at $474,000 on the general contract for erecting a group of hospital buildings at Bakersfield for Kern County.

Calif., Whittier — Store—Hotel — Doyle Construction Company, Chapman Building, has the contract to finance and erect a 4-story and basement class C store and hotel building at southeast corner of Philadelphia and Washington Sts., Whittier. Cost, $225,000.

Calif., Long Beach — Store—Apartments—Dr. C. D. Dewey, 1075 American Ave., Long Beach, is reported preparing to erect an $80,000, 2-story brick store and apartment building with a bungalow court in the rear at 1075 American Ave., Long Beach, for himself. Work to start in February.

Calif., Glendale—School—Bids have been received by trustees of Glendale union high school district for erecting new high school bldgs. at southeast corner of Broadway and Verdugo Road, Glendale. John C. Austin, 1125 Baker-Detwiler Bldg., and G. M. Lindsey, Glendale, associated architects. Bids will be taken separately on the general contract, plumbing, heating, wiring, program clocks, and painting. Cost, $550,000. The main building will be 2-story, 225 x 350 ft., and will contain administration offices, auditorium and class rooms. The science building will be 2-story, 145 x 70 ft., reinforced concrete construction, plastered exterior, cast stone trimming, tile and comp. roofing, pine trimming, steel roof trusses for auditorium, concrete balcony, plenum and direct steam heating.

Calif., Hemet—School—The $75,000 bond issue of the Hemet Valley school district carried at the recent election. The money realized will be expended for the completion of a junior high school, remodeling of the high school building, and erection of a high school auditorium and gymnasium.

Calif., Fresno — School — Brown & Stafford, Madera, have been awarded the contract at $62,097 for constructing concrete and brick auditorium for the Central union high school district, Fresno.

Calif., San Gabriel—City Hall — Architects Walker & Eisen, 325 Pacific Finance Bldg., are preparing plans for a new city hall to be erected at San Gabriel. Bonds in the sum of $50,000 have been voted. The building will be a 2-story, 50 x 100 ft., with a wing, 40 x 20 ft., and a tower. It will be of brick construction, plaster exterior, clay tile roofing, pine trim, oak floors, etc.

Calif., Los Angeles—School—Architect Parker O. Wright, Central Building, has completed plans for a new school building to be erected at Meridian Street school site. It will be 2-story, containing 15 rooms; brick construction, comp. roofing, pine trim; $104,000. The board of education will advertise for bids shortly.

Calif., Santa Barbara—Hotel—John M. Williams has the contract and has secured a permit for the erection of the new Carrillo hotel at the southeast corner of Carrillo and Chapala Sts. The building which will be of reinforced concrete construction, 5-story, will cost $350,000. There will be 180 rooms, 175 baths, lobby, dining room, etc. Architecture will be of modified Spanish style with central light court to the rear. Plans were prepared by Architects Marston & Van Pelt, Pasadena. The hotel has been leased to the El Encanto Hotel Company. It will probably be ready for occupancy in the fall.

Calif., Santa Monica—Apartments—Architects Ruoff & Munson, 1107 Story Building, have completed preliminary plans for a 6-story class A apartment and club building to be erected on Palisades Blvd., Santa Monica; owner withheld temporarily; will contain 140 rooms, divided into 70 apartments with complete clubrooms on 6th floor, lobby and entrance for club and apartments; $300,000.

Calif., Los Angeles—Cafe—The Martin Decorating Company, 107 No. Western Ave., is preparing plans and has the contract to erect a restaurant and cafe building of Moorish architecture, to be erected at Washington and National Aves., for the Green Mill Catering Com-

pany, Morrie Rauch, president, H. W. Hellman Building; will contain terraced dining room to seat 1,000, lounging and rest rooms, kitchen, large lobby and dance floor, 55 ft. diameter. Frame construction, 1-story and part 2-story, plastered exterior, 80 x 200 ft., maple, tile and marble floors, gas furnace heating system, ventilating system, staff work, metal lath, ornamental iron, lawn sprinkling system; the site covers 8 acres, to be landscaped and lighted; $200,000.

Calif., La Habra—School — A bond issue of $55,000 will be voted on at a special election to be held soon in this district. Plans for additional buildings, to be erected on the recently added Espold tract, are being prepared. One of the proposed buildings will be 7 rooms with kindergarten.

Calif., San Bernardino—School—A school bond election for $140,000 to provide two additional buildings will be held in the city school district in about two weeks. The resolution was unanimously adopted by the board of education.

Calif., Los Angeles—Arthur Hesse, 1117 Hollingsworth Building, has prepared plans and will erect a brick bank, store, and apartment building at 8th Ave. and Washington St., for Alex Taylor; will consist of 4 stores, market, drug store, banking space and 90 rooms, divided into 74 apartments; $185,000.

Calif., Hollywood—Hospital—Architect Robert H. Orr, 1305 Van Nuys Building, has completed plans and is taking general bids for the erection of a new hospital building at Vermont Avenue near Sunset Blvd., for Hollywood Hospital Assn. Five-story, reinforced concrete construction; main section 192 x 40 ft., with wing 60 x 40 ft., training school, emergency hospital, dining room and culinary department in the first story, executive offices, X-ray department, maternity department, operating rooms, and rooms for 150 beds in upper stories; stucco exterior, tile and composition roofing, solariums, marble and tile work, steam heating, vacuum cleaning, refrigerating system, 2 elevators; $300,000.

Calif., Anaheim—City Hall—The $165,000 bond issue for completion of city hall building and improving city park and certain street work, carried at the recent election. The funds will be apportioned as follows: $100,000 for city park, $40,000 for completion of city hall, and $25,000 for resurfacing Lincoln Ave. and paving street intersections in the residence sections.

Calif., Arrowhead—Hotel—Atwood Construction Company, E Street, San Bernardino, and Lake Arrowhead, has been awarded a contract at $245,000 for erecting a 3-story and basement hotel building at Lake Arrowhead; Swasey-McAfee, 405 Hibernian Building, architect. The front section will be 175 x 45 ft. with two wings each 140 x 32 ft.; frame construction, plaster and half timber exterior, shingle roof, pine trim, oak and pine floors, comp. baths, steam heating. It will contain 85 guest rooms with 90 per cent baths, lobby, parlors, dining rooms, service department.

Calif., Los Angeles—Apartments — Architect Kenneth MacDonald, Jr., San Francisco, is preparing plans for a 12-story class A apartment house to be erected at northeast corner of Wilshire Blvd. and New Hampshire Street for William Crittenden, E. Tropp and A. C. Blumenthal, Loew State Building. It will be 50 x 130 ft., reinforced concrete construction, and will contain 350 rooms. Cost, $1,000,000.

Calif., Los Angeles—Hotel—Architects Dodd & Richards, 905 Brack Shops Building, are preparing preliminary plans for a 12-story and basement class A hotel building to contain 250 rooms, each with bath, to be erected on property adjoining Hotel Clark on south, for E. P. Clark, proprietor of Clark Hotel.

Calif., Los Angeles—Church—Architect Albert C. Martin, 430 Higgins Building, is preparing plans for the new church to be erected at Adams and Figueroa Streets for St. Vincent's Church. It will be Spanish style and will cost $500,000. It will be 50 x 225 ft., brick and reinforced concrete construction, stone facing, tile roofing, interior trim of stone, marble and tile work, staff ornamentation, direct and indirect steam heating, pipe organ. There will also be a tower, 150 ft. high, of reinforced concrete construction with stone facing.

Colo., Denver—Church—Mountjoy & Frewen, local architects, have completed plans for a new Sacred Heart Catholic church to be erected at East 28th and York Sts. Cost estimated at $200,000.

Colo., Denver—Residence Hall — Construction has started on a $200,000 residence hall to be erected at Regis College. The plans for the buildings, drawn by H. J. Manning of Denver, call for a 3-story brick and stone structure and will contain 150 private rooms with showers, lounging rooms, porches, billiard rooms, trunk rooms, etc. It is the first unit of the projected buildings for the greater Regis College, for which a fund campaign was conducted last October.

Colo., Boulder — Dormitory — A dormitory to house women students at the University of Colorado, adjacent to the campus, is planned, according to local reports, by a group of business men headed by Dr. O. S. Fowler, one of the regents.

Colo., Denver—Store—Offices—A 2-story building on one of the prominent down-town corners will be started shortly by the Fontius Shoe Co. Architects estimate the cost at $150,000. Display window lighting will be one of the features of the new building, it is said.

Colo., Denver—City Hall—Construction work on Edgewater's new city hall, to cost approximately $50,000, will begin at an early date. The building will take the form of a community center building. It was designed by H. W. J. Edbrooke, Denver architect.

Idaho, Boise—C. C. Anderson has filed articles of incorporation with a capital of $2,500,000, to build a string of 13 stores in Idaho, Oregon and Colorado.

Mont., Butte—Lodge—The contract for the new addition to the Butte Masonic Temple on West Park Street has been awarded to A. Broadland. The addition will be built on the site of the Colonial Hotel, which is now being torn down, the cost to be about $350,000.

Mont., Butte—Hotel—The new Finlen Hotel, costing about $750,000 including the furnishings, is to be built by A. Broadland. The contract calls for completion by Jan., 1924.

Mont., Helena—Institution — Four new buildings are to be constructed for the state institution for the feeble minded at Boulder. The contract will amount to about $200,000 and will be built to afford additional residential quarters. The foundations are now in the process of construction.

N. M., Marcial—School — Architects Trost & Trost, El Paso, Tex., are preparing plans for a $40,000 high school bldg., to be erected at Marcial. Plans will be ready within 60 days.

Ore., Corvallis—Lodge—Corvallis Elks' Lodge has voted to erect a $60,000 temple, building operations to start at an early date. A lot has been donated by Julian McFadden and Johnson Porter on Second and Monroe Streets on which to erect the building.

Ore., Eugene — Theater — A new and well equipped theater costing $75,000 is to be built in Eugene for A. H. McDonald. It will be 50 x 160 ft. and of concrete construction, planned by Orlo R. Hossack.

Ore., Portland—Hotel—A residence hotel is to be erected by Herbert Gordon, for Mrs. E. J. Campbell at 11th and Main Streets. The $200,000 structure is to have four stories and a basement and it is the intention to make it one of the most modern buildings of its kind in the city. It will occupy a space of 150 x 100 ft.

Ore., Portland—Hotel—A 3-story summer hotel will be erected at Gearhart, work to start immediately, completion by July 1. The hotel will contain 98 rooms. It will be located on a 10-acre tract overlooking the ocean and golf links. Cost is estimated at $200,000. It will be financed by stockholders of the Gearhart Hotel Company, of which Julius L. Meier is president.

Ore., Portland — Hospital — Plans have been prepared by Sutton & Whitney and excavation work started by Abbott & McCulloch on the new $260,000 hospital for crippled children, to be erected by the Shriners at the southwest corner of East 82nd Street and Sandy Boulevard. The building will be a fireproof structure, built in three sections.

Ore., Portland—School—A 3-story addition is to be added to the Kenton School, 65 x 70 ft., costing $68,000. John Almeter is the contractor.

Ore., Portland—Lodge—The New Odd Fellows' Temple contracts have been let to Steele & Davis for $75,224, brick and terra cotta work complete. The heating has gone to Eugene Ruedy at $15,224. Further awards are to be made on marble, ornamental iron and interior decorating.

Ore., Portland—Apartments—Plans are being prepared by Carl L. Linde for a $60,000 apartment house to be erected by F. B. Turner at the southwest corner of Schuyler and E. 17th St. N. The building will contain 17 apartments, each equipped with an electric range and other modern conveniences.

Ore., Portland—Apartments—A frame apartment house to cost $40,000, planned by L. H. Hoffman, is to be erected at 645 Lovejoy Street.

Ore., Portland — School — The new Holladay school is to be built 360 x 90 ft. with the heating plant housed in a separate building. Architect A. E. Doyle has drawn up the plans, which include 20 class rooms, two stories with ordinary construction with masonry walls, faced with red brick and trimmed with cast stone. The building will cost when completed about $225,000.

Ore., Portland—Offices—Six additional stories on the north side of the Pittock Block are to be constructed soon, and have already been signed for a ten-year lease to the O. W. R. & N. and the Union Pacific Railroads. The new addition will provide 90,000 sq. ft. of floor space and will cost approximately $350,000. A. E. Doyle is the architect.

Ore., Portland—Bank—A four-story addition to the First National Bank Building is to be erected by the Security Savings & Trust Co. at a cost of $350,000. F. H. Miles, of Portland, is the contractor.

Ore., Portland—Apartments — A modern 160-room apartment house is to be built at East 20th and Hawthorne Ave. This structure will be five stories in height, and will be composed of 2, 3 and 4-room apartments. It will be of the very latest type for up-to-date equipment.

Utah, Ogden—Apartments—The Taylor Building Company has taken out permit for the erection of a $37,000 apartment house at the corner of 27th Street and Madison Avenue. Stephens Brothers will erect a 36-room apartment house at the corner of 26th Street and Adams Avenue.

Utah, Logan—Lodge—Logan Lodge No. 1453, B. P. O. E., will purchase property at Third West and Center Street and spend $25,000 for renovating for use as a lodge building.

Utah, Salt Lake City—Lodge—The Elks Lodge has subscribed $135,000 to complete the new building on South Temple Street.

Utah, Salt Lake City—Offices—Plans are announced by C. A. Quigley for the construction of a 20-story office building in Exchange Place, opposite the Commercial Club Building, to cost $1,500,000. Pope & Burton, architects; H. W. Baum Co., contractors. The building will be a class A steel structure. The top floor of the building will be utilized for a convention hall, a professional library and a law library. The ground floor will be one large office room, in

which desk room and accommodations will be rented. The remaining floors of the building will be devoted to offices fitted up for use of professional men entirely. The desk space idea on the ground floor is a development of Mr. Quigley's own idea. The ground floor will have a ceiling 21 ft. above the floor, and a mezzanine floor will be arranged in this compartment. Mr. Quigley plans to furnish this space entirely with mahogany office furniture, and to divide it with brass railings. Office service will be supplied to the tenants. A telephone private branch exchange will take all telephone calls of the renters, and stenographic service will be supplied on the hourly basis, on demand.

Wash., Seattle—Hotel—George B. Post & Sons, in charge of construction of Seattle's new community hotel to cost $2,500,000, have appointed E. F. Manahan to supervise construction. Mr. Manahan recently finished supervision of erection of the New Statler Hotel in St. Louis.

Wash., Everett — Apartments — Rudolf Hartmann announces plans for a $60,000 apartment house to be constructed in the city. Structure will be of brick veneer, 3 stories high.

Wash., Seattle—Store—Standard Construction Company, on a bid of $40,000, received the contract for the store and loft building, 60 x 108 ft. in size, 2 stories high, to be built by the Alvin Investment Company.

Wash., Seattle—Apartments—Architect W. E. Dwyer has completed plans for a 3-story apartment house, 72 x 109 ft., containing 18 apartments, to be built for C. A. Swanson.

Wash., Sedro Woolley — School — The Union High School District recently voted bonds in the sum of $150,000 for the erection of a modern high school. Plans provide for a brick structure, two stories high, containing gymnasium, auditorium, and 24 class rooms. Stephens, Stephens & Brust, architects, Seattle, are preparing plans and will call for bids shortly.

Wash., Bremerton — Hospital — Authority has been given the commandant of the Puget Sound Naval Station here for the expenditure of $150,000 in remodeling and enlarging the navy yard hospital. The work will be done with Navy Yard labor.

Wash., Aberdeen—Bank—Offices—The Greene Engineering Company has been awarded the contract for the construction of the block for the Aberdeen Savings and Loan Association. The cost of the structure complete will be about $50,000.

Wash., Seattle—Residences—Mylroie & Chapman, contractors, will construct sixty modern homes costing more than $250,000 in the North University district, during the winter. Structures will contain five, six and seven rooms.

Wash., Seattle—Hotel—Seattle's new community hotel, the Olympic, will be officially started on April 1, when construction work will begin. Tenants will be notified to vacate on that date.

Wash., Seattle—Lodge — Seattle Lodge, B. P. O. E., is planning the erection of a building on property adjoining its present building, to cost approximately $1,100,000. Preparatory to the new construction the Seattle lodge proposes a competition, limited to Seattle architects, on the plans, rules for which have been drafted by the local chapter of the American Institute of Architects. Substantial prizes will be offered.

Wash., Walla Walla—Dormitory—The general contract for the Whitman College men's dormitory was awarded to O. D. Keen of Walla Walla for $64,720, subject to slight modification.

Wash., Spokane—Lodge—The Knights of Columbus are to have a new $250,000 centrally located lodge home, plans for which are already being drawn. Specifications call for every modern club convenience, including a large auditorium, ball room, lodge rooms, gymnasium, swimming pool and other facilities. Edward P. Ryan, grand knight of the local council, is responsible for the announcement.

Wash., Hoquiam—Theater — Plans are being made for a new movie picture theater to seat 1,000 people. The structure will be fireproof in every detail and will cost $45,000, with an additional $25,000 for furnishings.

Wash., Spokane—Garage — A reinforced concrete garage, 70 x 90 ft., will be added to the labor temple plans. The temple and garage will cost, exclusive of the ground and excavation already made, $150,000.

Wash., Tacoma—Hospital—The lowest bid submitted to the U. S. Treasury Department at Washington, D. C., for the construction of the proposed U. S. veterans' neuro-psychiatric hospital to be built at American Lake, near Tacoma, was submitted by the Sound Construction & Engineering Company, Seattle, at $1,276,264. Bids are under consideration in Washington. The general contract calls for the construction of 28 new fireproof buildings, installation of lighting, sewer, water and heating systems, and considerable street work and walk construction. The bid is substantially lower than any other submitted.

Wash., Everett — Hospital — John Arrington, Seattle, on a bid of $215,297, submitted low figure for the construction of the proposed Everett General Hospital. Twelve bids were submitted, and are under consideration by the hospital directors and architects, Bebb & Gould. The structure is to be 3 stories high, of fireproof construction, 42 x 208 ft. in size, of brick and stone construction, with accommodations for 72 beds.

Wash., Aberdeen—Bank—Greene Engineering Company received the contract for erection of a building for the Aberdeen Savings & Loan Association, to cost $50,000.

Wash., Olympia — Hotel — Contract for construction of a 22-room addition to the Mitchell Hotel has been awarded to the West Coast Construction Company, Seattle, at a cost of $45,000.

Wash., Seattle — Chapel — The Sisters of the Sacred Heart will begin work immediately on the construction of a two-story chapel building in connection with the order's orphanage. The building will be 95 x 40 ft. in size, and will cost $75,000.

Wash., Wenatchee—Courthouse—The Board of Chelan County Commissioners has received bids for the construction of the proposed new courthouse to be erected in Wenatchee at a cost of $340,000. Morrison & Simpson, Spokane, architects, prepared the plans.

Wash., Seattle—School — Beezer Bros., architects, have completed plans for a three-story and basement masonry school building to cost $75,000, to be built by the St. Joseph's Church. The structure will cover a ground area of 115 x 114 ft.

Wash., Seattle — Garage — The Pacific States Construction Company received the contract recently for construction of a one-story and basement fireproof garage building and service station for Frank D. Black, Inc., to cost $75,000.

Wash., Seattle—Apartments—Contract for the 3-story and basement apartment building to be built by P. A. Tramontin, has been let to Walter & Brady. Structure will be 52 x 108 ft. in size, and will cost $85,000. Each apartment will be equipped with electric range, and electric elevators will be installed.

Wash., Kelso—Hotel — Members of the Kelso Club are planning the erection of a modern fireproof hotel of 150 rooms, to cost $300,000.

Wash., Kelso—Court House — Cowlitz County will build a new court house in Kelso, and W. W. Lucius of Portland is to be the architect. The cost is to be between $120,000 and $150,000.

Wash., Seattle—Store—Mrs. M. N. Carman, ladies' specialty shop, has leased the Wilkes Theater building for 20 years, and will immediately convert the structure into a modern 5-story commercial building, at a cost of approximately $200,000. The Great Northern Construction Company, Seattle, has the contract.

Wash., Seattle — Institution — Hans Pederson, general contractor, recently received the award of contract for erecting the proposed St. Vincent's Home for the Aged in West Seattle. The structure will be 5 stories high, and will cost approximately $1,000,000.

Wash., Walla Walla—School—Low bid for the construction of the proposed men's dormitory at Whitman College, has been submitted by O. D. Keen of Walla Walla, on a bid of $64,720, for the general contract alone. All bids have been taken under consideration.

Wash., Seattle — Office — Contract for the 3-story Ford service and sales station to be built by E. F. Sweeney of the Sweeny Investment Company, has been awarded to Sylliasson & Sando, general contractors, on a bid of approximately $85,000.

Wash., Seattle—Church — Plans for the proposed $60,000 church structure to be erected by the Mt. Baker Park Presbyterian Church, are being prepared by A. H. Albertson, architect, Henry Building. Structure will be of brick and terra cotta, with auditorium seating 400.

Wash., Seattle—Office—Plans for a 15-story and basement fireproof office building to cost $1,000,000, have been completed by Architect Frank H. Fowler and R. Hamilton Rowe, Smith Building. The proposed building will be for the exclusive use of doctors and dentists in the city and will be built by the Doctors and Dentists Building Company. Contract for construction has been entered into with the Great Northern Construction Company, contingent on the sale of stock to finance the structure.

Wash., Seattle—Apartments — The John Collins Estate plans the immediate erection of a big apartment building to cost $290,000, at 5th and Cherry Streets. John A. Creutzer, architect, Leary Building, will prepare plans. Structure will be 6 stories high, 124 x 126 ft. in size, containing 107 two and three-room apartments, electrically equipped throughout.

Wash., Seattle—Garage—The Arena, a combined garage and store structure, is to be enlarged by the addition of three stories, making it a 6-story structure, at a cost of $100,000. Metropolitan Building Company owns the structure and A. H. Albertson, architect, is preparing plans.

Wash., Spokane—Hospital—A 25-unit hospital to cost approximately $50,000 will be constructed in the spring by the Evangelical Lutheran Deaconesses and Hospital Association. The architect has not yet been selected.

Wash., Seattle—School—The Des Moines District will construct a new union high school at a cost of $80,000, which will accommodate 300 pupils.

Wash., Seattle—Hotel — The Corrine-Simpson-Wilson Company plans the immediate erection of an apartment-hotel in the University District at a cost of $750,000. The building will be 6 stories and basement, 144 x 104 ft. in size, containing 99 apartments of one to five rooms each. General contract has been let to the Puget Sound Bridge & Dredging Company, and work will begin immediately.

Wash., Seattle—Store—The First-Pike Corporation plans the immediate construction of a 2-story and loft building to cost $70,000. John Graham, architect, prepared the plans and will receive bids.

Wash., Longview—Store—The Long-Bell Lumber Company has awarded to the Westlake Construction Company of St. Louis contract for its proposed 2-story, 120 x 150 ft. store and office building, to cost $125,000.

Wash., Tacoma — School — A bond issue of $2,000,000 will be voted on at the next school election for the construction of new school buildings to provide room for the over-crowded school rooms.

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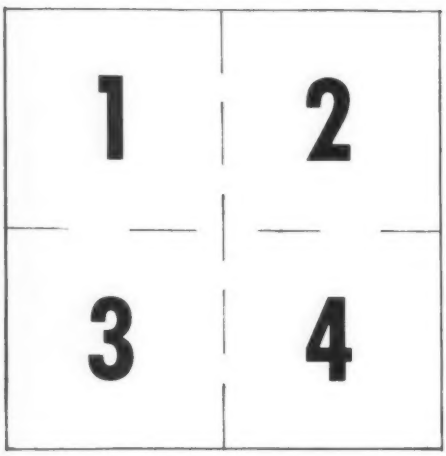

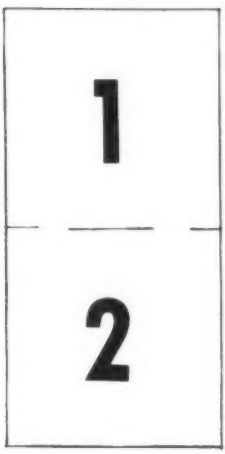

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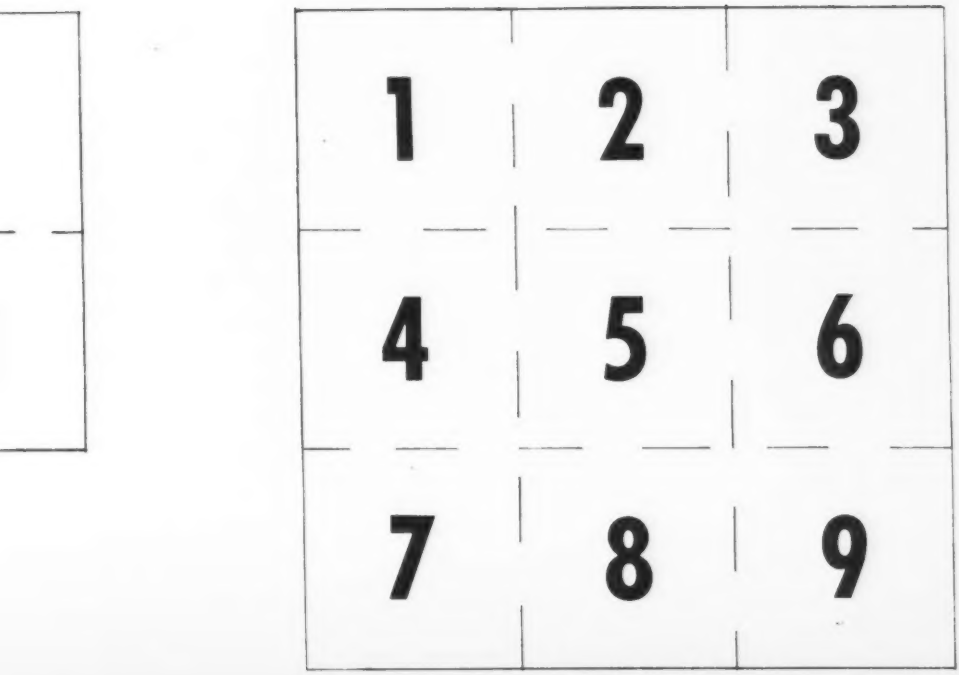

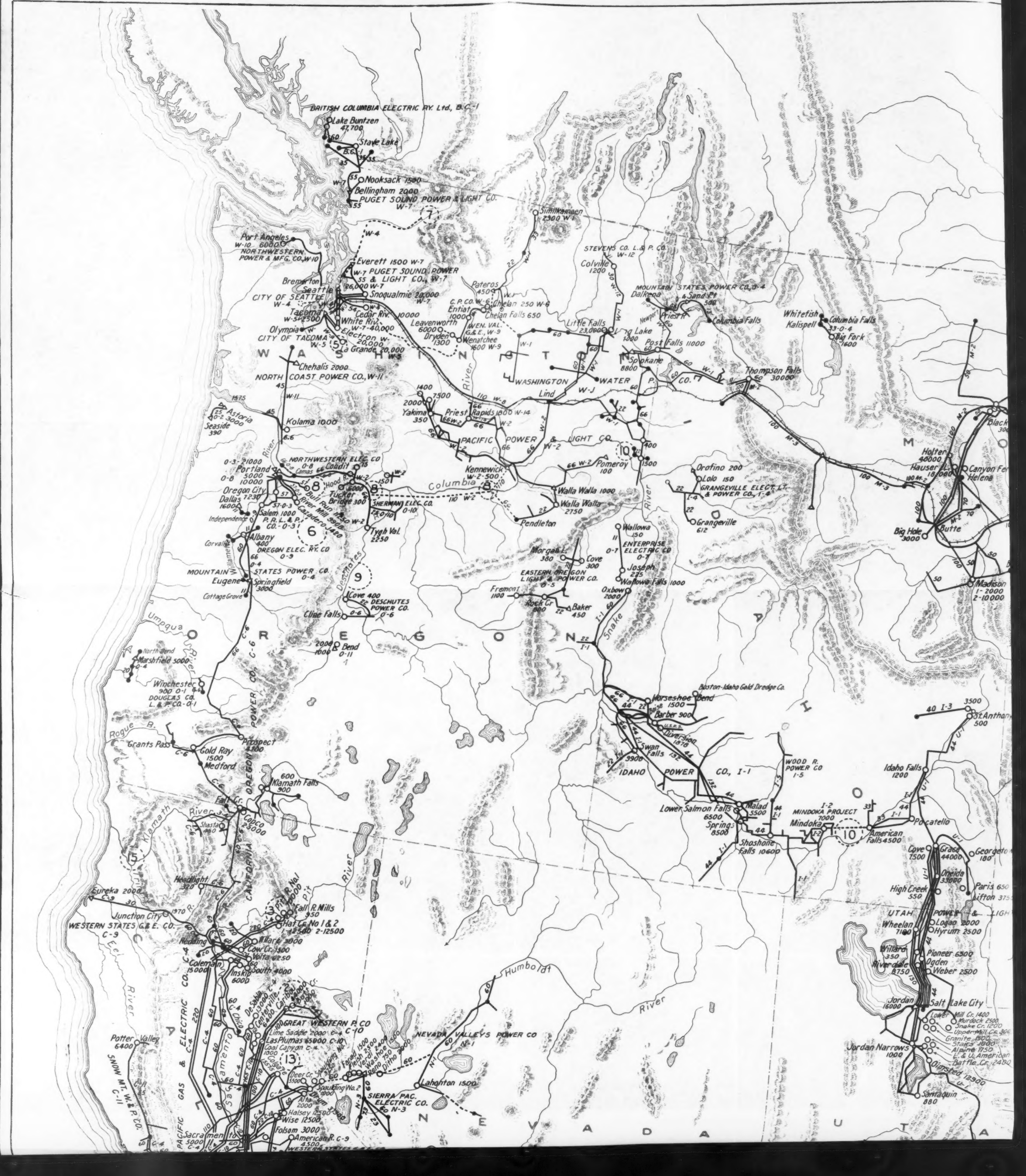
BRITISH COLUMBIA ELECTRIC RY. Ltd., B.C.-1
Lake Buntzen 47,700
Stave Lake
Nooksack 1500
Bellingham 2000
PUGET SOUND POWER & LIGHT CO. W-7
Similkameen 2500 W-1
Port Angeles W-10 6000
NORTHWESTERN POWER & MFG. CO. W-10
Everett 1500 W-7
PUGET SOUND POWER & LIGHT CO. W-7
Bremerton
Seattle
CITY OF SEATTLE W-4
Snoqualmie 20,000 W-7
Tacoma W-5 12500
Cedar Riv. 10000
White Riv. W-7 40,000
Electron W-20,000
Olympia
CITY OF TACOMA W-5
La Grande 20,000
Leavenworth 6000
Dryden 1300
Wenatchee 1600 W-9
WEN. VAL. G. & E., W-9
Pateros 450
Chelan 250 W-6
Chelan Falls 650
C.P.CO. W-6
Entiat 1000
Little Falls 23,000
Long Lake 1000
Post Falls 11000
Spokane 8800
Thompson Falls 30000
STEVENS CO. L. & P. CO. W-12
Colville 1200
MOUNTAIN STATES POWER CO. I-4
Dalkena
Priest R.
Columbia Falls
Whitefish
Kalispell
Columbia Falls
Big Fork 1600
Newport
WASHINGTON WATER P. CO.
Lind W-3
Chehalis 2000
NORTH COAST POWER CO. W-11
Kolama 1000
Astoria 3000
Seaside 390
Yakima 7500 2000 350
Priest Rapids 1800 W-14
PACIFIC POWER & LIGHT CO. W-2
Kennewick W-2 500
Pomeroy 100
Walla Walla 1000
Walla Walla 2750
Pendleton
Columbia River
Snake River
NORTHWESTERN ELEC. CO. O-8
Portland 5000 10000
Camas
Hood R.
Condit
Tucker Bridge 300
Bull Run 1750
Cazadero 1400
Oregon City
Dallas 1230 1600
Salem 1000 P.R.L. & P. CO. O-3
Independence
Albany 400
Corvallis
OREGON ELEC. RY. CO. O-3
MOUNTAIN STATES POWER CO. O-4
Eugene
Springfield 3000
Cottage Grove
Willamette River
SHERMAN ELEC. CO. O-10
Tygh Val. 2250
Deschutes
Cove 400
DESCHUTES POWER CO. O-6
Cline Falls
Bend 1000 2000
Morgan L. 380
Cove 300
EASTERN OREGON LIGHT & POWER CO. O-5
Fremont 1100
Rock Cr 900
Baker 450
Wallowa 150
ENTERPRISE ELECTRIC CO. O-7
Joseph 275
Wallowa Falls 1000
Oxbow 2000
Orofino 200
Lolo 150
GRANGEVILLE ELECT. L.T. & POWER CO. I-4
Grangeville 612
Holter 40000
Hauser 18000
Canyon Ferry
Helena
Big Hole 3000
Butte
Madison 1-2000 2-10000
Umpqua River
North Bend
Marshfield 5000
Winchester 900 O-1
DOUGLAS CO. L. & P. CO. O-1
Rogue R.
Grants Pass
Gold Ray 1500
Medford
Prospect 4100
CALIFORNIA OREGON POWER CO. C-6
Klamath Falls 600 900
Fall Cr.
Copco 2000
Klamath River
Shasta 460
Headlight 320
Eureka 2000
Junction City
WESTERN STATES G. & E. CO. C-9
Redding
Eel River
Pit River
PIT R. No. 1 2000
Fall R. Mills 950
Hat Cr. No 1 & 2 12500 2-12500
Iron Gate
Klamath
Willark 3000
Cow Cr. 1500
Volta 4250
Coleman 15000
Inskip 6000
South 4000
PACIFIC GAS & ELECTRIC CO.
De Sabla 13000
Centerville 6400
Cal. Caribou 4000
Potter Valley 6400
Lime Saddle 2000 C-4 C-10
Las Plumas 65000 C-10
Coal Canyon C-4
Chico
Sacramento River
GREAT WESTERN P. CO
Deer Cr. 5500
Spaulding No. 1 1900
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Alta 2000
Halsey 12500
Wise 12500
Folsom 3000
American R. C-9 4500
Sacramento 5000
PACIFIC GAS & ELECTRIC CO.
SNOW MT. W. & P. CO. C-11
Farad 1500
Fleish 3500
Verdi 2400
Washoe 1500
Reno 750
Ditho 2000
NEVADA VALLEYS POWER CO
Lahonton 1500
SIERRA PAC. ELECTRIC CO. N-3
Humboldt River
Boston-Idaho Gold Dredge Co.
Horseshoe Bend 1500
Barber 900
U.S.R.S. Diversion 1978
Swan Falls 132
IDAHO POWER CO., I-1
WOOD R. POWER CO I-5
Lower Salmon Falls 6500
Malad 5500
Springs 8500
Shoshone Falls 10600
MINDOKA PROJECT 7000
Mindoka
American Falls 4500
Pocatello
Idaho Falls 1200
St. Anthony 500
Grace 44000
Georgetown 180
Oneida 33000
Paris 650
Cove 7500
High Creek 550
Clifton 375
UTAH POWER & LIGHT
Wheelan 7100
Logan 2000
Hyrum 2500
Willard 350
Riverdale 8750
Pioneer 6300
Ogden
Weber 2500
Jordan 16000
Salt Lake City
Lower Mill Cr. 1400
Murdock 2500
Snake Cr. 1200
Upper Mill Cr. 300
Granite 1500
Stairs 1800
Alpine 1750
L. & U. American
Battle Cr. 2480
Jordan Narrows 1000
Olmsted 12900
Santaquin 880
NEVADA
UTAH
IDAHO
OREGON
WASHINGTON

Similkameen 2300 W-1
STEVENS CO. L. & P. CO. W-12
Colville 1200
MOUNTAIN STATES POWER CO. 0-4
Dalkena & Sand Pt
Columbia Falls
Whitefish Kalispell
Columbia Falls 33-0-4
Big Fork 1600
Havre
Little Falls 23,000
Post Falls 11000
Spokane 8800
Thompson Falls 30000
WASHINGTON WATER P. CO.
Lind W-3
Great Falls 60000 Rainbow 35000
Black Eagle 3000
MONTANA POWER CO. M-2
Lewistown 1-350 2-100
Missouri River
Holter 40000
Hauser L.
Canyon Ferry 7500
Helena
Pomeroy 100
Orofino 200
Lolo 150
GRANGEVILLE ELECT. LT. & POWER CO. I-4
Grangeville 612
Walla Walla 1000
Walla Walla 2750
Pendleton
Wallowa 150
ENTERPRISE ELECTRIC CO 0-7
Joseph 225
Wallowa Falls 1000
Morgan L. 380
Cove 300
EASTERN OREGON LIGHT & POWER CO. 0-5
Oxbow 2000
Rock Cr 800
Baker 450
Snake River
Big Hole 3000
Butte
Chicago, Milwaukee & St. Paul R. R. M-3 & W-6
Yellowstone River
Bozeman
Billings 1000
Madison 1-2000 2-10000
Boston-Idaho Gold Dredge Co.
Horseshoe Bend 1500
Barber 900
U.S.R.S. Diversion 1918
Swan Falls 132 9900
IDAHO POWER CO., I-1
WOOD R. POWER CO 1-5
St. Anthony 500
Idaho Falls 1200
Lower Salmon Falls 6500
Malad 5500
Springs 8500
Shoshone Falls 10600
MINDOKA PROJECT 7000
Mindoka
American Falls 4500
Pocatello
Cove 7500
Grace 44000
Georgetown 180
Oneida 33000
Paris 650
Lifton 3750
High Creek 550
UTAH POWER & LIGHT CO., U-1
Wheelan 7100
Logan 2000
Hyrum 2500
Willard 350
Riverdale 8750
Pioneer 6500
Ogden
Weber 2500
Jordan 16000
Salt Lake City
Lower Mill Cr. 1400
Murdock 2500
Snake Cr. 1200
Upper Mill Cr. 300
Granite 1500
Stairs 1800
Alpine 1750
L. & U. American Fk. 2200
Battle Cr. 2400
Jordan Narrows 1000
Olmsted 12900
Santaquin 880
Humboldt River
Green River
North Platte R.
COLORADO POWER CO. CO-1
Shoshone 15000
Georgetown 1350
Boulder 10000
Denver
NEVADA
UTAH
WYOMING
COLORADO

REVISED MAP OF

Western Hydroelectric Systems

SHOWING

Transmission Lines, Power Plants, Some Major Undeveloped Water Power Sites

As of February 1, 1923

COMPILED AND EDITED BY

Journal of Electricity and Western Industry

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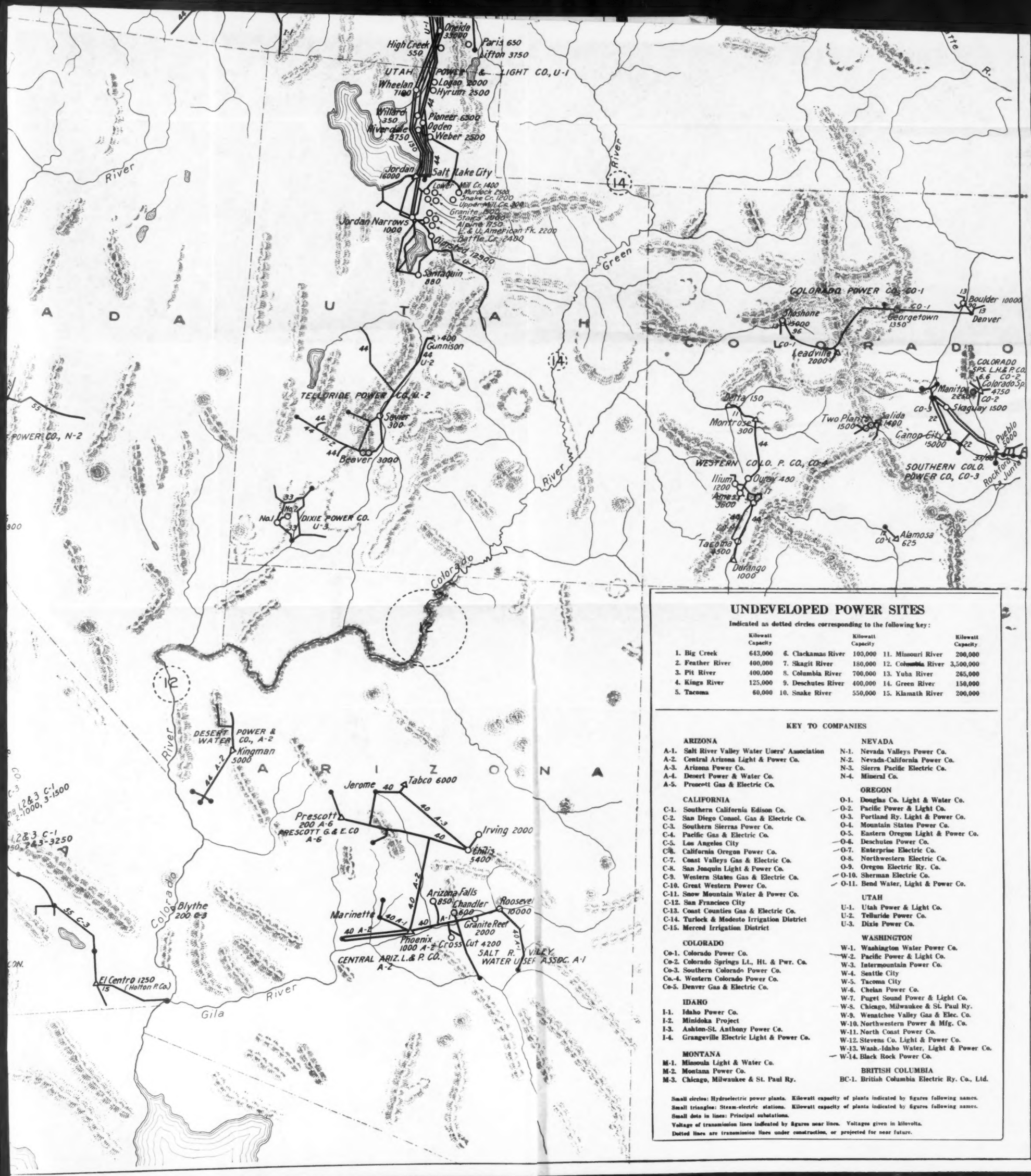
Scale of Miles

0 50 100 150

"Supplement to Feb. 1, 1923, issue JOURNAL OF ELECTRICITY AND WESTERN INDUSTRY"



UNDEVELOPED POWER SITES

Indicated as dotted circles corresponding to the following key:

	Kilowatt Capacity		Kilowatt Capacity		Kilowatt Capacity
1. Big Creek	643,000	6. Clackamas River	100,000	11. Missouri River	200,000
2. Feather River	400,000	7. Skagit River	180,000	12. Columbia River	3,500,000
3. Pit River	400,000	8. Columbia River	700,000	13. Yuba River	265,000
4. Kings River	125,000	9. Deschutes River	400,000	14. Green River	150,000
5. Tacoma	60,000	10. Snake River	550,000	15. Klamath River	200,000

KEY TO COMPANIES

ARIZONA
- A-1. Salt River Valley Water Users' Association
- A-2. Central Arizona Light & Power Co.
- A-3. Arizona Power Co.
- A-4. Desert Power & Water Co.
- A-5. Prescott Gas & Electric Co.

CALIFORNIA
- C-1. Southern California Edison Co.
- C-2. San Diego Consol. Gas & Electric Co.
- C-3. Southern Sierras Power Co.
- C-4. Pacific Gas & Electric Co.
- C-5. Los Angeles City
- C-6. California Oregon Power Co.
- C-7. Coast Valleys Gas & Electric Co.
- C-8. San Joaquin Light & Power Co.
- C-9. Western States Gas & Electric Co.
- C-10. Great Western Power Co.
- C-11. Snow Mountain Water & Power Co.
- C-12. San Francisco City
- C-13. Coast Counties Gas & Electric Co.
- C-14. Turlock & Modesto Irrigation District
- C-15. Merced Irrigation District

COLORADO
- Co-1. Colorado Power Co.
- Co-2. Colorado Springs Lt., Ht. & Pwr. Co.
- Co-3. Southern Colorado Power Co.
- Co.-4. Western Colorado Power Co.
- Co-5. Denver Gas & Electric Co.

IDAHO
- I-1. Idaho Power Co.
- I-2. Minidoka Project
- I-3. Ashton-St. Anthony Power Co.
- I-4. Grangeville Electric Light & Power Co.

MONTANA
- M-1. Missoula Light & Water Co.
- M-2. Montana Power Co.
- M-3. Chicago, Milwaukee & St. Paul Ry.

NEVADA
- N-1. Nevada Valleys Power Co.
- N-2. Nevada-California Power Co.
- N-3. Sierra Pacific Electric Co.
- N-4. Mineral Co.

OREGON
- O-1. Douglas Co. Light & Water Co.
- O-2. Pacific Power & Light Co.
- O-3. Portland Ry. Light & Power Co.
- O-4. Mountain States Power Co.
- O-5. Eastern Oregon Light & Power Co.
- O-6. Deschutes Power Co.
- O-7. Enterprise Electric Co.
- O-8. Northwestern Electric Co.
- O-9. Oregon Electric Ry. Co.
- O-10. Sherman Electric Co.
- O-11. Bend Water, Light & Power Co.

UTAH
- U-1. Utah Power & Light Co.
- U-2. Telluride Power Co.
- U-3. Dixie Power Co.

WASHINGTON
- W-1. Washington Water Power Co.
- W-2. Pacific Power & Light Co.
- W-3. Intermountain Power Co.
- W-4. Seattle City
- W-5. Tacoma City
- W-6. Chelan Power Co.
- W-7. Puget Sound Power & Light Co.
- W-8. Chicago, Milwaukee & St. Paul Ry.
- W-9. Wenatchee Valley Gas & Elec. Co.
- W-10. Northwestern Power & Mfg. Co.
- W-11. North Coast Power Co.
- W-12. Stevens Co. Light & Power Co.
- W-13. Wash.-Idaho Water, Light & Power Co.
- W-14. Black Rock Power Co.

BRITISH COLUMBIA
- BC-1. British Columbia Electric Ry. Co., Ltd.

Small circles: Hydroelectric power plants. Kilowatt capacity of plants indicated by figures following names.
Small triangles: Steam-electric stations. Kilowatt capacity of plants indicated by figures following names.
Small dots in lines: Principal substations.
Voltage of transmission lines indicated by figures near lines. Voltages given in kilovolts.
Dotted lines are transmission lines under construction, or projected for near future.

OF ELECTRICITY AND WESTERN INDUSTRY, Rialto Bldg., San Francisco, Calif."